THE RAILWAY REVIEW

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OPENING OF THE NEW LOCK IN THE "SOO" CANAL.—It is thought that locking through the American lock at Sault Ste Marie will begin during the first few days in August. The dredging in the approaches is in pace with the work on the lock proper. The machinery is receiving finishing touches, and some of it has been "turned over," with eminently satisfactory results. The power house and office building will not be finished until after the close of the season, but this will in no way interfere with the operation of the lock. The three Westinghouse pumps which will be used to empty the chamber in case of accident, were turned over a few minutes Thursday night and worked to perfection. The pumps can be started at any time within an hour when there is only cold water in the boilers.

MACHINERY VS. BRAINS.—The skilled workman of to-day is as much a product of the times as the machines he is so largely occupied in tending, and though the operative of to-day may be individually as intelligent, and undoubtedly far better educated, and an all around better citizen than his predecessor of a previous generation, yet, so far as his actual work is concerned, brain power is being practically superseded by steam power. I make this rather sweeping statement deliberately and with a sincere conviction that, disguise it how we may, while our machines are becoming almost human, nay, almost superhuman in their powers, the workman himself is, as a matttr of fact, more and more nearly approximating to the condition of an automaton—a wage earning machine. He is living upon the brains of dead and gone inventors, pioneers of mechanical industry, like Maudsley and Bramah and Whitworth. The mechanic of the present day gets through his day's work without the necessity of exerting himself to more than the most trifling extent, either bodily or mentally. I quite admit that this is a gain, on the whole, for all the parties concerned; for the workman, because though is work is lightened, he earns better wages, and is at liberty to devote his intelligence to doing good for himself in other ways—his status is raised; he has time and opportunity for rest and rational recreation; his day's work is not, as formerly, his day's sole occupation. It is a gain, too, for his employer. A single man's production is now from five to fifty times what it was in the early days of mechanical engineering. It is good for the community at large—directly, because the increased facility of production lessens the price at which good articles may be purchased, and, indirectly, because the man, relieved from exhausting toil, is a more valuable citizen than he who has no leisure to devote to the improvement of himself and his fellows. I must not, therefore, be understood as conveying a reproach when I assert that the mechanic of the period has his mental as well as his bodily labor performed for him.—W. D. Wansbrough in Cassier's Magazine.

THE TIDAL WAVE IN JAPAN.—According to mail advices from Yokohama dated June 18, three days after the occurrence of the tidal wave, show that previous accounts of its disastrous effects were by no means exaggerated. The center of disturbance was the island of Kikiwazan, and the coast was swept for 170 miles to Hachnye. Every town between the two places named was damaged, and some were utterly destroyed. Four hundred persons perished at Hashakami, and 300 buildings were wrecked. At Koidizumi there were 1,450 victims, and at Motoyosh the death roll numbered 1,030, while 560 buildings were destroyed at the last named place. Repeated earthquakes took place at Moroika on June 15. The eastern coast of Iwaitcken was swept by the tidal wave, and the damage done is utterably indescribable. The towns which suffered the most were Kamaish, Nyoko and Sakari. Two thousand people were killed in the Sakarima Chikesen district. The whole coast of Sapporo and the eastern coast of Miyagi-ken have been literally washed away. The total loss of life and property by the awful convulsion is enormous.

THE STRENGTH OF MONIER PLATES.—The growing use of iron and cement combined in construction has led Mr. T. Grut, member of the Danish Society of Engineers, to investigate, theoretically, the strength of the so-called Monier plates, where a thin sheet, or combination of rods, of iron is built into the cement. According to an abstract from "Ingenioren" published in Engineering News he remarks that the usual method of assuming the neutral axis to pass through the center of the plate, as though the whole was a homogeneous mass, is a superficial one, and proceeds on more rational lines by taking into account the different co-efficients of elasticity of the two materials. That of iron being well known, the investigations have a special interest through the selection of a co-efficient for cement. Experiments in Europe, and several by the author are reviewed, and it is concluded that for cement mortar 1 to 3, and half a year old, the co-efficients of elasticity for tension and compression are practically alike, and their value lies between 300,000 and 400,000 kg. per sq. cm. (4,266,000 and 5,688,000 lbs. per sq. in.); nearer, however, to the lower limit. It is also noted that these values are considerably higher for the mortar mentioned than for pure cement. After an extended analytical investigation the author recommends the following two rules: First, that the neutral axis in a Monier plate, where the iron is placed at a distance of one-sixth the thickness of the plate from its lower edge, be assumed to lie at a distance of three-quarters the thickness from the same edge. In this case the tensile resistance of the cement is not considered; a course which the author believes to be the most prudent. Second, that the iron should not be strained above 525 kg. per sq. cm. (7,465 lbs. per sq. in.) This, the author remarks, is really using a safety factor of four, as the ultimate strength of a Monier plate is at the limit of the elasticity of the iron; for as soon as that limit is passed the expansion of the iron becomes so rapid that the cement, whether it be above or below the plate, cannot follow it, but breaks, and the Monier construction, as such, is destroyed.

HEAVY LOCOMOTIVES.—I have noticed on many railroads lately, what must be patent to all men, the tendency toward an increase in the size and power of the locomotives that are used. A big locomotive is all right for handling a heavy train at high speeds, but, says J. H. Allen in Dixie, to me it appears to be a very doubtful piece of economy to use an exceedingly heavy engine for trains of moderate weights at moderate speeds. To specify: I should say that for an eight car train running at a speed of 40 miles an hour over an undulating track with moderate grades, an engine with cylinders 19 in. in diameter, a stroke of 24 in. and cutting off at 5 in. is too heavy. It is very true that locomotive and stationary practice are not strictly comparable, but both classes of engines have cylinders in which pistons move to and fro, and where it has been demonstrated in one case beyond all possibility of peradventure that there is no economy in a cut-off that takes place earlier than one-quarter stroke, it does seem that the rule should have some sort of an application to locomotive practice. It is more than probable that a reasonable length of cut-off, say a trifle later than one-quarter, and a speed regulation by the throttle will prove to be more economical than a shorter cut-off and the throttle lever back against its stops. While I know that many locomotive engineers agree with me in that statement, I am well aware that others look upon it as the rankest heresy, which only goes to prove that all men do not see alike and that even a newspaper writer cannot please everybody.

This matter of speed regulation by throttle brings up another little matter. There never has been and never will be a locomotive boiler built that has a steaming capacity sufficient to supply all the steam that could be blown through a 6 in. dry pipe, and what is more, most people are surprised when they learn for the first time how small a throttle opening is sufficient to supply steam for a locomotive. A case in point is that of an engineer who was hauling a five car train with a 16x24 engine at a speed of from 40 to 45 miles an hour over an undulating track. He ran with the reverse lever hooked back to cut-off at 6½ in and the throttle partly open. Night after night he would run over the division with the throttle in the same latch and his train on time. When the engine came in for repairs we took off the dome case and set the throttle lever as he used it. The valve was of the old fashioned grid-iron type with three openings about 5 in. long each, and these were uncovered so that the blade of a penknife could just be crowded through. Of course, that must have meant considerable wire drawing in the steam chest and it is probable that if we had had an indicator card it would have shown a rapid falling away of pressure immediately after the commencement of the stroke; but the fact remains that the engine did make time on this small throttle opening and, what is more, the coal consumption was as low as any other on the division, which after all is the crucial point, for an engineer may run in any manner that suits his own fancy and his work will be satisfactory provided his train is on time and coal consumption low. But he must know how to do it just the same.

PROSPECTIVE BUSINESS FOR RAILWAY MATERIAL FIRMS.—An English writer to the American Manufacturer notes that proposals are now before the Indian government for assembling an official committee at Simla, under the presidency of the Viceroy, for a comprehensive consideration of the railway schemes which have been suggested for adoption from various parts of India. The Punjal government proposals for local railway construction have recently been received in Calcutta. No less than 36,000 miles of new lines are projected, 12,000 miles of which are represented as urgent. The report on Indian railways for 1895 is a record of great progress. Over 3,800 miles were under construction or sanctioned. Under date June 29 the Rangoon correspondent of the London Times announces that a powerful syndicate has purchased the Burma State Railways system. The price is stated to be £6,000,000. Nearly 1,000 miles are open to traffic. Success is said to be "already assured," and with intelligent development of the railways this province will, so it is asserted, "become a magnificent property." Concerning railway construction in Africa—which can scarcely any longer be termed the "Dark Continent"—it is satisfactory that the Uganda Railway is being rapidly pushed forward. This is clear from the information to hand on June 30, that the ceremony of laying the first rail has now taken place, and was made the occasion of much rejoicing. The information of the progress of the line is received here with every gratification. In view of Mr. Cecil Rhodes' decision to reside in Khodena and assist in the development of the country, a rumor from Natal of the Beira-Cairo Railway scheme is invested with new importance. Mr. Rhodes is said to have hired a party of surveyors to traverse the coast for him—it will occupy about seven years—and report as to railway possibilities. Curiosity is aroused among railway material firms concerning the alleged admission of Li Hung Chang, the Chinese special envoy, that a Russian railway will be built through Manchuria, but questions in the house of commons a day or two ago addressed to the under secretary for foreign affairs failed to elicit any information either in confirmation or denial of the rumor. Something definite will doubtless be learned on the subject on the occasion of the intended visit of the Chinese special envoy to London on or about the end of the month.

THE JAFFA-JERUSALEM RAILWAY.—Major Law in his report to the British Parliament upon the railways of Asiatic Turkey in reporting upon the Jaffa-Jerusalem Railway, says that this road is approximately 52 miles long. It is a narrow gage line, 1 meter wide. The railway was opened towards the close of the year 1892. The concession dates from 1888, and includes the right to make branches to Nablous and Gaza. The capital of the company is £160,000 in shares, and £800,000 in 5 per cent, bonds The working of this railway has so far not proved very profitable. I have not been able to obtain any precise figures as to the traffic and working expenses, but it is stated that the net profit has been under £2,000 per annum, and such a return is insufficient to pay the interest on the bond capital. Hitherto this railway has been almost entirely dependent on its passenger traffic, which at certain seasons is very considerable, and is steadily increasing. It is, however, hoped that a prolongation to the sea, offering greater facilities for goods traffic, will give to railway carriage a decided advantage over the old system of transport by pack animals, which has till now maintained a successful competition. There is no port at Jaffa, and no special facilities for the construction of one, whilst the sea in winter is often for days together so boisterous that it is impossible to land or to embark. The exports from Jaffa consist principally of barley and oranges,and amount to about 50,000 tons annually. The extension of the railway to Nablous might increase the trade, and in time an important increase of production for export will result from the establishment of the Jewish colonies in Palestine. In addition to the project of an extension to Nablous, there are many other schemes for extending the Jaffa-Jersualem Railway, and amongst others it has been proposed to include this line in a system which should connect Alexandria and Port Said with Damascus. I do not think that any of these schemes are likely to be carried out at present, and in any case it would seem difficult for a narrow-gage line leading only to an exposed roadstead to assume importance in a large trunk-line system.

LOCOMOTIVE FIRE-BOXES SHOULD BE INSPECTED.—An English contemporary publishes an account of a locomotive boiler explosion which occurred on a private line railway belonging to the Madeley Coal & Iron Company near Newcastle under Lyme in November last which emphasizes the importance of inspecting fire-box sheets. The boiler, which was 20 years old, was of the ordinary multitubular type, fitted with a copper fire-box, the crown of which was attached to the crown of the shell with screwed and nutted stud stays. The fire-box was made of 7-16 in. plate, with the exception of the tube plate, which was ⅞ in., and was stayed on all sides with screwed studs 7-16 in. diameter, pitched a little over 4 in. apart. The boiler was originally made for a working pressure of 140 lbs., but for some time before the explosion the working pressure was nominally supposed to have been reduced to 120 lbs. After the explosion, however, the Board of Trade surveyor found this was inaccurate, and that the safety valves were loaded to 160 lbs. and 150 respectively; in addition to this the fire-box was wasted on the fireside over a considerable area, until its thickness was reduced from 7-16 in. to a little more than ⅛ in. The heads of the stays had also wasted away, so that the thin plate was left practically unsupported. At the time of the explosion the engine was standing on a siding. When the fire-box gave way the locomotive was lifted from the rails, and swung round at right angles, with the tender end resting on the top of a loaded coal truck. Two men who were on the foot plate at the time were killed, while three others were injured. One of the unfortunate men killed was a mechanic in the employ of the coal company, whose duty it was to regularly inspect the locomotive. His death, of course, rendered it impossible for him to make any explanation as to how the fire-box came to get in such a defective condition.

THE GOUBET SUBMARINE BOAT.—A French inventor M. Goubet, has been for several years working on designs for a submarine boat, which according to foreign journals, seems at last to have been put in practical form. Between 1889 and 1891 a submarine boat of his invention underwent a lengthy series of trials at Cherbourg, but was unfavorably reported on by the French authorities. Since that time, it is claimed, M. Goubet has modified the features to which objection was taken and his new boat, "Goubet II" has proved so far a success that several foreign governments are said to have given orders for these vessels. The boat is described as follows: The vessel is spindle shaped, the hull being made of broad rings of bronze bolted together; its length is 26 ft. 3 in., and its diameter at the largest part 5 ft. 8 in. The keel is somewhat like a fin in shape, and there are also fin like strips on the side. The single screw projects from the stern, and is so made as also to answer the purpose of a rudder. The motive power is electricity. Oars project from the hull and are intended to serve as subsidiary means of locomotion in time of need. The vessel is sub-

merged by admitting water into the hull, and the whole submersion device is controlled automatically. A monometer is provided, and this being set for a particular depth keeps the vessel at that depth even when her buoyancy is suddenly altered (accidentally or otherwise). Due provision is made for maintaining the stability of the boat. When she rises to the surface a device is ready to enable the captain to look about and see the condition of affairs. In addition to the captain the craft is intended to carry two men. Fresh air is chemically supplied. Automobile torpedoes are to be carried, and they can be started from within.

RAILROAD POOLING.*

HON. MARTIN A. KNAPP, Interstate Commerce Commission.

There is little doubt, I apprehend, that those who are at all familiar with the situation of our railroad systems are practically united in favoring some relief from the existing prohibition of "pooling;" and with such persons the principal controversy upon this question relates to the safeguards which are deemed essential to prevent an abuse of the privilege. Convinced as I am that the interests of the public would be promoted by allowing rival railroads to substitute co-operative for competitive methods, yet believing that such a grant of power should be coupled with certain restrictions, I venture to set forth, in my own way and from my own point of view, some of the reasons which have influenced my own conclusions.

The basis of the argument is found in a perfectly obvious and elemental fact. The most primitive condition of mankind, the first attempts at social contact, involved a place of passage from one habitation to another. The earliest association between families and tribes required a pathway across the intervening ground which separated their rude abodes. The gradual change from the nomadic to the permanent occupation of the soil, with the final outcome of private ownership in land, compelled the dedication of certain portions as public roads to which all had equal access. The simplest conception, therefore, of civil society assumes and includes the common highway. The street is a part of the state. As families united in tribes and tribes grew into nations, with multiplied wants and more complex relations, the keener became the need for these avenues of intercourse; the higher the civilization the greater their necessity. This necessity is not simply for their existence, but for their common and equal enjoyment without preference or exception. Whether built and maintained at public expense, as are ordinary streets and roadways, or constructed by private capital with the view to private gain, like turnpikes and chartered railways; in either case the right to their use, on like terms to all, is a primary requirement of organized society.

It must be borne in mind that the public road was the sole means of communication by land, the only pathway of internal commerce, until modern discovery utilized steam as a practical motive power. Before this agency was brought into service, while the old highways were yet exclusively employed, the right to their common use was rarely doubted or denied. In recent times certainly,—and this is the point of importance—the established roads, the strips and stretches of land set apart as ways of passage, have everywhere been regarded as common property; and the privilege of using these thoroughfares has been the equal and recognized possession of every person.

All this seems trite enough, yet it is a fact of vital import; it is the essential element of personal liberty. The right to pass to and fro upon the highway, to occupy it at pleasure, for travel and the transportation of property, to use it equally with all others, is among the first of those natural and inherent rights which are termed inalienable. Upon the full enjoyment of this right rests the freedom of the individual and the opportunity for success in the struggle of life.

But the transfer of land commerce from roadway to iron tracks, with the substitution of steam for animal power, has not impaired the nature of this right or diminished in the least its inestimable value. On the contrary, there is no pursuit or employment which is not now more dependent than ever before upon the means provided for public transportation. The railroad has become the principal highway. For long distance movement it has wholly supplanted the public road, yet it performs the same service and meets the same unique and indispensable need. Hence, the railway of to-day, this wonderful vehicle of modern commerce, has become the chief factor of industrial life the *sine qua non* of its power and progress, the constant and unyielding condition on which personal welfare and social advancement continually depend.

It follows, therefore, from the fundamental office of transportation, that to provide the highways of travel and the agencies of inland exchange is a function of government not merely legitimate but primary and inherent. To regard these agencies as private property, subject to the rules which govern the management of other possessions, is a mistaken and misleading conception. Upon this point there is much confusion of thought and surprising want of correct understanding. The difference between the facilities of conveyance and the various vocations which depend on those facilities is often ignored or wholly overlooked. The patrons of our railroads, and sometimes their managers as well, are slow to perceive that the business of public carriage is essentially unlike all private occupations. The agencies by which inter-communication is effected, and by which all the products of labor acquire exchangeable value, are not always regarded as the instruments of a public service, but too often looked upon as mere private belongings to be dealt with as interest or caprice may determine.

But railroad transportation is not a commodity; it is distinctly a service. The physical appliances by which this service is performed are property, they are acquired; not so the right to their use, that is enjoyed. The ownership of the carrier becomes the privilege of the public. In order that private enterprise may furnish this means of conveyance it must possess special and extraordinary powers granted for that purpose by the state. Through the exercise of these powers the railroad participates in the duties of civil administration and discharges obligations which are innate in the constitution of society. For reasons of expediency the sovereign abdicates its authority in this particular in favor of corporations which it has created, but this circumstance does not change the nature of the service or the principles which should govern its performance.

On this foundation, laid in the nature and necessities of social order, rests the common right to just and impartial charges for public transportation. The railroads are an agency of the state for discharging a public duty of the highest utility. They are not vendors of merchandise, free to make secret and varying bargains with their customers, but the purveyors of a public privilege which all are entitled to enjoy on the same terms. Neither official station, personal distinction nor patronage of unusual volume, furnishes a defensible ground for giving one man cheaper conveyance than another. The right to use the facilities which the carrier affords, like the right to the common highway, is a natural and inalienable right, the very essence of which is equality; and some invasion of that right is found in every deviation from charges usually imposed. If the state should itself undertake to supply the public need in this direction, no discrimination in rates would be tolerated or excused. Every function which government performs, every power which it directly exerts and every activity which it assumes to control must be exercised for the equal benefit of all. Anything short of this would be deemed offensive and tyrannical. The farmer who sends but one letter a year is entitled to the same rate of postage as the merchant who sends hundreds a day. The measure of import duties is the same whether the entry be a case or a cargo. This should be the rule applied to railroad charges. The larger shipper is entitled to no advantage over his smaller competitor, either in rates or facilities, for both should be served on the same terms. If concessions to particular persons because of their greater influence or patronage would not be possible under government ownership, they should not be permitted under private ownership. If in one case the rule of equality would be observed, in the other it should be enforced. As I look at the matter, the state has as much right to farm out the business of collecting its revenues, and allow the persons performing that service to vary the rate of taxation according to their own interest, as it has to permit the price of public carriage to be the subject of special contract or secret dicker, to be made unequal by favoritism or oppressive by extortion. No duty of government is more imperative or capable of more useful performance than the duty of enforcing reasonable and impartial charges by the carrying corporations. Yet if these are correct views of the nature and office of public transportation, it is evident that actual competition—as that term is commonly understood—in the rates offered by rival carriers is inconsistent with the principles upon which railroad operations should be conducted.

An appeal to experience and the observed results of competitive methods leads to the same conclusion. The difficult situation with which legislation has lately undertaken to deal was the natural outgrowth of excessive construction and unregulated management in the two feverish decades which followed the civil war. In many parts of the country this was an era of visionary schemes and crazy speculation. The eager clamor of the people for the facilities of rail conveyance incited numerous projects which were doomed to financial failure. In the reckless haste to secure railroad transportation, an unwarranted premium was offered to those who would furnish it. Enormous grants of public lands, donations of private property and endless obligations in the form of county, town and municipal bonds were freely and often inconsiderately given to aid the extension of railway lines into remote districts and undeveloped regions. They were built in many instances where little traffic existed, and where paying returns could not be reasonably be expected for many years. The energy thus exhibited was prodigious, but much of it was misdirected. The capital obtained for many of these ventures was secured upon conditions and coupled with exactions which prudence would have shunned, while lavish expenditure and dishonest management added to the evils of premature construction.

Not only were great trunk lines extended to the Pacific, but these were quickly supplemented with branches and feeders designed to control the carrying trade in the territory claimed to be tributary to the original system. In their eagerness to get possesion of districts relied upon for future business, the rival companies frequently overlapped each other and duplicated roads in localities where adequate patronage could not be secured for a single line. The fiercest competition for the limited traffic obtainable was the inevitable outcome, while the necessity for sufficient earnings to meet fixed charges and operating expenses tempted resort to every device and allurement by which business could be secured. The same conditions existed, though in lesser degree, in the more developed and productive portions of the United States. At this juncture, also, the Canadian Pacific road was pushed across the continent, built by government aid and subsidized by government bounty, thereby increasing the complication and multiplying the opportunities for transportation abuses.

Generally speaking, the right to engage in the business of railroad transportation has been practically unlimited, because under the laws of the different states the formation of railway corporations is easily effected, and the restraints to which they are subjected meager and ineffectual. This prolific creation of common carriers by the facile machinery of local statutes, has resulted in an aggregation of railroads, all of which, with few exceptions, derive their origin and power from state authority. The vast operations which they carry on are controlled by separate boards of management, and the relations between different lines are friendly or hostile as interest or jealousy dictates. Their united capacity greatly exceed the volume of traffic furnished for transportation, and so a large part of the competitive business must either be parceled out by unstable agreements, or contested for from day to day with ruinous rate-cutting and vicious discriminations. Every new line increases the friction, and frequent receiverships testify to pecuniary burdens which current revenues are unable to bear.

It needs no argument to show that the worst evils connected with railroad transportation are the result of unequal and discriminating charges. By whatever scheme or device one shipper obtains lower rates than another, when both are in similar relations to the carrier, the transaction in every guise is an unwarrantable injury to private rights and a plain violation of public duty. That one man should have an arbitrary advantage over his fellows in respect of a common necessity is repugnant to every notion of equality and offends the rudest conception of justice. Of what avail are industry, enterprise, integrity, or any of the qualities which make for success, if a befriended competitor can secure reduced rates or special facilities? When this indispensable service is performed on varying and uncertain terms, when secret concessions are made to one or more persons in a given line of business, those from whom higher charges are exacted are placed at a serious and sometimes fatal disadvantage. In each case the race is not to the swift nor the battle to the strong, but to the one whose "cut rates" are the lowest.

The ultimate effect of preferential rates is to concentrate the commerce of the country in a few hands. The favored shipper, who is usually the large shipper, is furnished with a weapon against which skill, energy and experience are alike unavailing. When the natural advantages of capital are augmented by exemptions from charges commonly imposed, it becomes powerful enough to force all rivals from the field. If we could unearth the secrets of these modern "trusts," whose surprising exploits excite such

*Address delivered before the Political Economy Club of the University of Chicago and published in the annals of the American Academy of Political and Social Science.

wide apprehension, we should find an explanation of their menacing growth in the systematic methods by which they have evaded the burdens of transportation. The reduced charges which they have obtained, sometimes by favoritism and oftener by force, account in great measure for the colossal gains which they have accumulated. This is the sleight of hand by which the marvel has been produced, the key to the riddle which has amazed and alarmed the nation. If these combinations were deprived of special and exclusive rates there is little doubt that they would be shorn of their greatest strength and lose their dangerous supremacy. Indeed, I think it scarcely too much to say that no alliance of capital, no aggregation of productive forces, would prove of real or at least of permanent disadvantage if rigidly subjected to just and impartial charges for public transportation. How to check discriminations of this kind is a most difficult question. Unlawful agreements between shipper and carrier are consummated in secrecy, and are all the more hurtful on that account. The means of concealment are practically unlimited; the mutual interest of the parties compels each to screen and protect the other; detection is often impossible. The fact that rate cutting and all kindred offenses are now criminal misdemeanors is undoubtedly a great restraint, for conscientious men are unwilling to transgress the law and the dishonest hesitate to incur its penalties; but the scruples of the former are sometimes overcome and and the latter will often run the risk of discovery. Moreover, the average public sentiment recognizes little moral turpitude in compacts to secure special favors from railroad corporations, and the general refusal to play the role of informer covers the transaction with comparative immunity. Arrangements between rival lines to maintain schedule charges are usually short-lived, for they rest mainly on a pledge of good faith, and do not long survive when interest inclines either party to break them. In addition to this the amount of property to be transported is extremely variable from time to time, while the carrying capacity of the roads is nearly a constant quantity. Hence at certain seasons of the years, or in the periods of commercial depression when the volume of shipments is greatly reduced, the strife to get business is exceedingly fierce. There are occasions where competition is so sharp, where the freights of some large shipper, or combination of shippers, is so needful to a particular road, that when reduced rates are demanded as the alternative of losing the business, the carrier can hardly refuse. Few traffic managers will submit to the diversion of important tonnage when a discount from schedule charges will serve to retain it; and so the unseemly scramble goes on with inevitable injury to the great mass of dealers and unfair profits to a few large concerns.

These observations are made for the most part from the standpoint of public welfare and without special regard to the interests of the carriers. A mere glance at the effect of existing methods upon railway earnings emphasizes the necessity for a change of policy and the adoption of co-operative measures. The situation of many railroads at the present time is not unlike that of the great powers of Europe. Each in a state of armed neutrality watches the other with jealous suspicion, and even in their most amicable relations they maintain an approximate peace only by lavish preparations for war. The process is expensive, the results wholly unsatisfactory. Their revenues are depleted, their management embarrassed, their usefulness greatly impaired. They collect from the people more than three millions of dollars every 24 hours—an enormous tax upon industry—yet their surplus receipts frequently fall below the requirements of solvency and are seldom sufficient to relieve the anxiety of investors. Making ample allowance for dishonest construction, excessive capitalization and wasteful methods of operation, the fact is positively startling that 60 per cent of our railway mileage has never paid a dividend on its stock obligations, while more than a quarter of that mileage is now, or has recently been, in the hands of receivers through inability to meet interest on mortgage indebtedness. It is claimed that reduction in published rates have not been proportionally greater than the reduced cost of moving the traffic resulting from better road-beds and improved equipment; yet notwithstanding the increase in volume of business the railroads are struggling to keep out of bankruptcy; while people are frequently complaining that the current charges are unreasonable. Now, I cannot take these facts,—the immense sums paid for railroad transportation, the small percentage of that sum actually required for train movement, and the financial condition of the companies at the present time,—I cannot take these facts and reconcile them with any just or defensible theory upon which railway operations should be conducted. I can draw no other inference than that an altogether unwarranted portion of railroad earnings is diverted, and necessarily diverted under present conditions, to purposes which are not legitimate to public transportation. Indeed, I believe that the general run of rates could be considerably reduced, though I do not regard those now in force as excessive save in rare instances, with much better returns to security holders than are now realized, if this wasteful warfare were wholly abandoned and the economies of association applied to railway management.

The benefits supposed to result from railroad competition I believe to be greatly exaggerated. Those who honestly uphold the present policy—to say nothing of those who oppose a change from unworthy motives—apparently assume that the public gets the same advantage from competition between carriers as from competition between producers and dealers generally. That this is a mistaken and fallacious view I am fully persuaded. I do not see how any one can derive benefit from competition in the matter of his daily wants, unless he is in a situation to choose freely between two or more persons who are each able to supply those wants. The objective value of competition, I submit, rests in the power of selection, and he who is debarred from choice must be deprived of any direct advantage from the rivalry of others.

As to most of our ordinary wants—broadly speaking—every person in every place has the opportunity to choose. If the only merchant in a remote hamlet charges more for his wares than his customers are willing to pay, there is another store at a near-by cross-roads where they can purchase the same commodities; and like liberty of selection is commonly enjoyed as to the various needs of social life, whether simple or complex. But in respect of railroad transportation only a few people comparatively are so situated as to have any available choice between carriers. So that, without amplifying the argument, the simple fact is that only a small percentage of population, and an exceedingly small fraction of territory, are so located as to have any practical opportunity for selection in the matter of public conveyance. To the great majority of people railway transportation is now a virtual monopoly. I do not mean to say that the competition between railroads connecting great cities by different lines has not had an indirect and important influence upon railroad charges at intermediate points which are dependent upon one of those lines alone; but I venture the opinion—again speaking broadly—that the limit of such indirect advantage has already been reached, and that further benefit from that source cannot reasonably be expected. The result is that a few commercial centers and a few large shippers, having this power of choice, and finding their traffic indispensable to the carriers, secure enormous advantages, either by evasion or violation of law, of which the masses are deprived. It is entirely plain to me, therefore, that co-operative methods, the general discontinuance of competition in rates between rival railroads, would tend strongly to remove the inequalities which now exist, and prove a positive and substantial advantage to the great majority of producers and consumers. And I firmly believe that while there is a popular objection to railroad pooling, founded largely upon ignorance of its purpose and misconception of its effects, the principal opposition to legalized co-operation, the opposition which has thus far prevailed, comes from the favored few who are reaping unearned profits by the discriminating practices which they virtually compel and of which they are the sole beneficiaries.

There is a radical difference, which seems to be frequently overlooked, between the "trusts" to which I have referred and a federation of railway carriers. This difference may be stated in a single paragraph. In actual property, the products of labor and skill which we eat and wear and use, we do not want—under present economic conditions at least—uniformity of price. The producer should be perfectly free to sell for all he can get, the purchaser equally free to buy as cheap as he can. The dealer should always be at liberty to make one price to one person and another price to another person, or to vary the price to the same person as and when he sees fit. In the exchange of goods there should be the utmost freedom of contract between the parties. In all private dealings between buyer and seller the power to bargain should be unrestrained, for in that power is the essence of commercial liberty. Therefore, speaking in general terms, whatever tends to uniform prices for actual property, as by limiting production or controling the markets, is to be deprecated and prevented. For this reason anti-trust laws, so-called, are defensible, perhaps necessary. But as respects public transportation, which is not property at all but a service, not a commodity but a function or agency of government, we do want uniform charges—under like conditions—without preference or exception to any person. Properly considered the tolls paid to the carrier are in the nature of a tax, and the relations between railroads and their patrons are not contract relations, save in a limited sense and for special purposes. Therefore, whatever tends to stability and uniformity of charge by railway carriers is on the whole to be desired and promoted. Indeed, I go to the extent of saying that we cannot have that free and fair competition in the fields of production which is the condition of industrial freedom, without methods and rates for public transportation which amount to a monopoly.

Practically, therefore, the choice lies between competition on the one hand, with the inevitable outcome of discriminations which favor the few at the expense of the many, or like charges for like service, which can be realized only by permitting and encouraging co-operative action by rival railroads. The power to compete is the power to discriminate, and it is simply out of the question to have at once the absence of discrimination and the presence of competition. I am forced to the conclusion that the prohibition of pooling which remains imbedded in the present statute is irreconcilably at variance with its other provisions. To my mind the legislation which decrees that all rates shall be just and reasonable, and declares unlawful every discrimination between individuals or localities, is plainly inconsistent with competitive charges. I regard the existing law as presenting this singular anomaly, that it seeks to enforce competition by the mandate of the statute, and at the same time to punish as criminal misdemeanors the acts and inducements by which competition is ordinarily effected.

(To be Continued.)

EXPERIMENTAL DRAIN CUP—C. B. & Q. R. R.

In the discussion of the report of the committee on "Location of Air Brake Cylinders on Freight Cars," at the recent convention of the Master Car Builders' Association Mr. G. W. Rhodes contributed from the experience on the Chicago, Burlington & Quincy Railroad in the matter of drain cups and exhibited a design for a cup with a removable screen

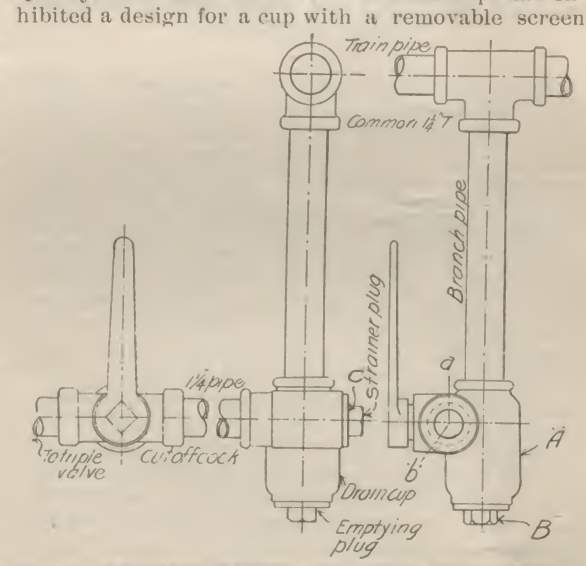


FIG. 1.—ARRANGEMENT OF CUP AND PIPING

with which that road had been experimenting. The design is shown in the accompanying illustrations which were prepared from drawings kindly furnished by Mr. Rhodes. The arrangement makes use of an ordinary T fitting in the main air pipe which has the advantage of bringing the two ends of the main pipe, where it is cut, so close together as to

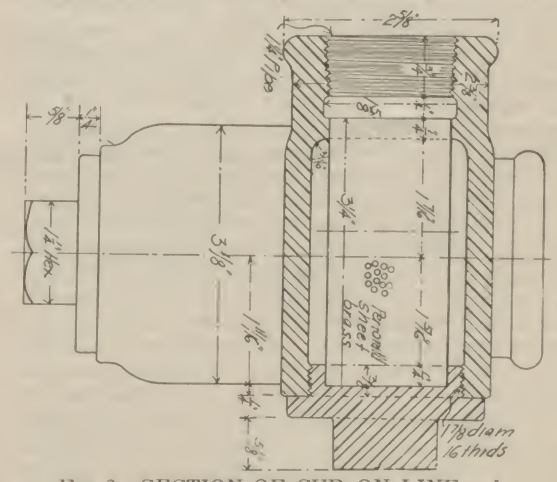


FIG. 2.—SECTION OF CUP ON LINE a b.

cause most of the dirt to pass by the opening and not drop into the receptacle A. That which does drop there, however, may be easily removed by unscrewing the emptying plug B. When it becomes necessary to renew the strainer or to examine its condition access may be had to it by means of the plug C. No disturbance of the piping is necessary in these operations which may be carried out without the attention of a pipe fitter and without special pipe tools.

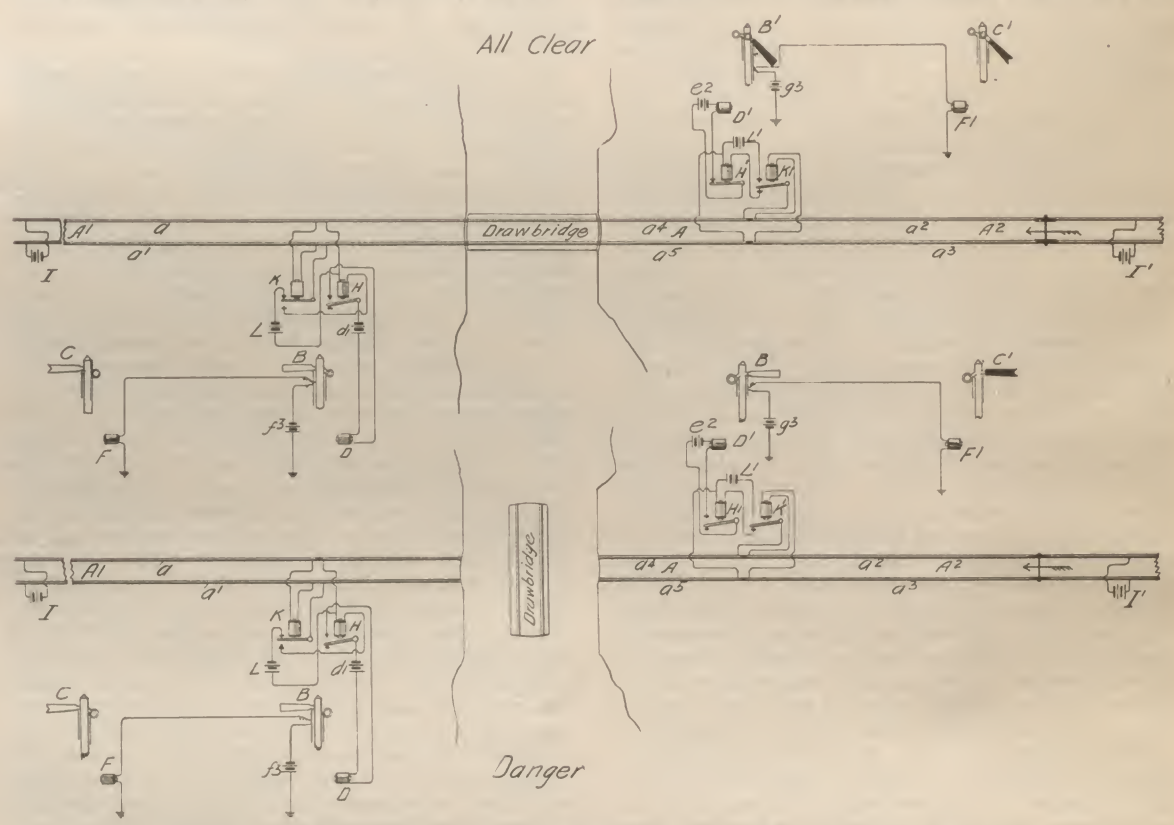
It has been customary to consider the strainer in the train pipe T in good condition unless the triple valve strainer was considerably stopped up by foreign matter and particularly with large particles of such matter. When this condition was discovered it became necessary to take down the train pipe and clean the strainer in the T. The design shown was arranged as an experiment to obviate the difficulties with the former practice, but Mr. Rhodes states that the necessity for such a cup and strainer is not so great since the Westinghouse people have introduced the perforated brass sheet screen which is well rolled into the casting, and the argument that the air which passes through the screen will keep the openings free is considered a good one. The design illustrated is an improvement upon the arrangement which was recommended by a member of the committee who in the discussion submitted a sketch of a plan in which a special T was used through the branch opening of which a cylindrical screen was fixed so as to strain the air passing through the branch and into the triple. This interposed a screen in the passage through the main air pipe at each triple valve connection and is objectionable owing to the impact with which the foreign matter will strike the screen and tne liability of its becoming firmly fixed. In addition to this is the objection of interfering with the free passage of air through the train pipe. If any complication is justified beyond the special T fitting with the perforated sheet screen used by the Westinghouse people that shown by Mr. Rhodes seems to be the most promising of satisfactory results. The question is whether anything in the way of improvement upon that device is needed.

SIGNAL PROTECTION FOR DRAWBRIDGES AND TUNNELS.

The drawing from which the accompanying illustration was prepared, shows two positions or conditions of the apparatus which has been arranged by the Hasell Perfected Railway Signal Company, for the protection of dangerous points such as drawbridges and tunnels, the arrangement shown being especially adapted to single track lines. There were three positions outlined in the drawing, namely the "normal", "all clear" and "danger" conditions, the two showing "all clear" and "danger" being selected for presentation here. This apparatus employs track circuit with the usual batteries, relays, insulations and connections, and the signals are of the semaphore type, being operated by a specially designed electric motor controlled by a relay. The illustrations show a drawbridge and four signals, two of which are home signals and two are distant signals. The section of track denoted by A passes over the bridge, and upon each side of this section are two insulated sections denoted by the letters A1 and A2. At the beginning of section A, assuming the train to be going from the left to the right, the home signal B governs the approach to the drawbridge and in its normal position indicates danger. Signal B1 is on the opposite end of the bridge and the distant signals C and C1 are located at the proper distances outside of the home signals.

The signal B is under the control of an electric magnet D, the armature of which when the magnet is energized completes the circuit to the semaphore motor for throwing the signal to the safety position. Similarly the magnet D1 controls the movement of the signal B1. The distant signals are likewise operated by motors, the circuits for which are controlled by circuit breakers on the home signal posts and which are operated by the movements of the home signal semaphores. In operation suppose a train to be approaching the track section A going from the right toward the left as designated by the arrow in the all clear diagram. As soon as it passes the battery I1, the relay K1 is de-energized and its armature drops against the back stop. The opening of this relay completes the circuit through the coils of the relay H1 to the battery L, through the rails which pass over the drawbridge. This energizes the relay H1 and completes the circuit through the signal magnet D1, whereby the signal B1 is drawn down, and in so doing the circuit closer causes a corresponding movement of the distant signal C1 and gives authority for the train to proceed. If, however, the tion of the track over the drawbridge is occupied or for any reason the battery L is prevented from energizing the magnet H1 the signals B1 and C1 will remain in the horizontal positions and warn the engineer out of this section until the restoration of the safety condition. The opening of the drawbridge will accomplish this interference of the circuit as would a broken rail or any failure of the apparatus.

Neither the caution signal C1, nor the danger signal B1 can be thrown to safety by the entrance of the train upon the section A2 unless both the sections A and A1 are free from trains, no matter whether they be moving in the same direction as that entering A2, or in the opposite direction. This provides what may be termed preliminary protection, which is devised in order to prevent trouble from occurring in the event of two trains approaching the home signals simultaneously in opposite directions when without the preliminary protection, each engine runner on seeing the signal ahead going to danger would think that it was put to danger by the passage of his train. How this is accomplished is easily seen from the arrangement of the track circuit from battery I through the rails of section A1 to the magnet K. This magnet when open prevents the completion of the circuit from the battery L across the drawbridge to the magnet H1, to which



SIGNAL PROTECTION FOR DRAWBRIDGE BY THE HASELL SYSTEM.

reference has already been made. In the same manner a train coming from the left toward the right would clear its distant and home signals providing the sections A and A2 were both clear, but if a train were occupying either of them, the signals C and B would be kept at danger until the trains had passed off. The arrangement of the apparatus indicating danger is shown in the lower illustration, in which a train is approaching from the right with the drawbridge open, and the positions of the armatures show how the apparatus is prevented from clearing the signals under this condition.

TRAVELING ENGINEERS—THEIR DUTIES AND WHAT THEY MAY ACCOMPLISH.*

For reasons well known to members of this club, it is important that superintendents of motive power and master mechanics be at all times as well informed as possible as to the actual conditions of all locomotives in service, and the ability, character, and habits of the men operating them. I know of no way in which a master mechanic can keep himself so well informed in regard to these conditions as through the medium of competent, wide-awake, energetic traveling engineers.

It should be the duty of the traveling engineer to ride on all the locomotives in his territory as often as possible, at the same time properly attending to his other duties. When doing this he should scrutinize carefully the working of the engine in all its parts, its steaming qualities, and whether or not the best results are being obtained from fuel consumed. If not, he should determine whether it is through improper firing, poor judgement of the engineer, or faulty adjustment of draft appliances, clogged flues, or some other defect of the engine. If the trouble is with the engineer or fireman he should at once give instructions which will insure better results. If with the engine, he should instruct roundhouse foreman as to what alterations to make. He should also note the quality of coal furnished, and if it is a case of poor fuel he should report the matter promptly to his immediate superior.

He should report to his superior officer any apparent weakness of an individual engine or class of engines, and should suggest remedies for same or improved patterns for parts of engines that are not giving satisfactory service, and promptly correct both engineers and firemen when not doing their work properly. If the error is the result of ignorance or a mistaken idea, he should explain fully wherein it is wrong, and see that his instructions are fully understood. He should in all cases do this as a friendly instructor and not as a fault-finding critic.

He should always cheerfully give any information he is able when asked, and never in any way make light of, or speak deprecatingly of another's apparent lack of knowledge, but should deal firmly and decisively with all cases of willful or careless neglect of duty by engine or roundhouse men, and inform his superior when it is found that through incompetency or negligence such an employe is not a desirable man to retain in the service.

It should be his duty, in the absence of a regular examining committee, to examine all applicants for position as fireman or engineers, and all firemen for promotion. This perhaps is one of the most important of all his duties, and one which will try his patience as much or more than any other. It is the custom on some roads to require the traveling engineer to examine engineers and firemen who are applicants for promotion, not only on machinery but on general and time card rules as well. That portion of examination, I would consider, should be conducted by the superintendent or some competent official of the transportation department; or, better still by a regular examining committee.

These examinations should be very thorough and complete, but not a school of instruction. The examiner should not confine himself to a certain list of questions, and should require applicants to explain fully their answers to all question.

The examiner should particularly note the applicant's general appearance as to intelligence, disposition, adaptability, etc., and mention in his report of examination anything he may note that would tend to make him an undesirable man to employ or promote.

This feature of the examination should receive particular attention when examining applicants for promotion as firemen, as they are the men who will be looked to to fill the ranks of the engineers when a demand for them occurs, and only bright, intelligent young men should be accepted for those positions.

The traveling engineer should make a detailed report of his week's work to his master mechanic, making such suggestions as he may see fit for the betterment of the service. These suggestions should be acknowledged by the master mechanic, whether practicable or not, as the traveling engineer may make a suggestion or recommendation which in itself is all right, yet there may be some contingent of which he is not aware that would render it impracticable, and which if explained to him would not only encourage him but would educate him and make him more valuable to the company.

The traveling engineer should rank in authority next to the division master mechanic in the mechanical department, and should have authority to suspend temporarily any engineer, fireman or hostler for drunkeness, insubordination, flagrant disobedience of rules, of marked incompetency. He should have full charge of hostlers and wipers at outstanding engine houses or points where there is no roundhouse foreman. He should be given authority to order necessary work done on engines at roundhouses in his territory, and such changes as he may think best for the improvement of an engine, or among enginemen as he may consider necessary. The instructions should be given to the round house foreman, who should understand that they must be carried out—roundhouse

*Abstract of a paper read by Mr. C. E. Slayton befo the North-West Railway Club.

foreman being to that extent subordinate to the traveling engineer.

In the interest of traveling engineers the circular announcing their appointment should state their authority and general duties.

In considering what the traveling engineer may accomplish. I will say that I hope to see the time when there will be no traveling engineers, but instead road supervisors or foremen of engines and trains, having the same authority over engine and trainmen, reporting alike to superintendent and master mechanic, belonging to both mechanical and transportation departments, and to neither more than to the other. Until such a time railway companies will not get the best service from their traveling engineers, as, while they are considered as belonging wholly to the mechanical department, suggestions they may make for improvements, or information they may give of matters that should receive attention other departments, are too apt to be treated as unwelcome criticism and met with antagonism.

In connection with matters just mentioned I will read two circulars, issued on March 1, by Mr. R. Quayle, superintendent of motive power and machinery, Chicago & Northwestern Railway, he having kindly given me permission to do so in connection with this paper.

CHICAGO, March 1, 1896.

DUTIES OF ROAD FOREMEN OF ENGINES, RELATING TO BOTH OPERATING AND MECHANICAL DEPARTMENTS.

1. To administer discipline to engineers and firemen when necessary; and should enginemen not live up to instructions it will be the duty of road foremen of engines to have them taken off their engines at terminals or at points where other engineers or firemen can be secured, and the facts reported to the division superintendent as his judgement may dictate, for disposition of the case.

2. To report to division superintendents or their assistants any irregularities they may find in the train service, should the fault lie with the enginemen or train crew; and to visit the division or assistant superintendent's office once a week, or oftener if necessary, and give such information or offer such suggestions as will, in your judgement, if put in force, result in a better service.

It must also be understood by enginemen that they are in charge of the division superintendent when their engines have crossed the turntable, and are subject to his orders. Any delays that may be caused through the carelessness or negligence of train crews, or for any cause enginemen have failed to make their time, they will report the same to the division superintendent instead of the master mechanic as heretofore.

3. All engine failures will be reported at once to the division master mechanic.

RULES GOVERNING ROAD FOREMEN OF ENGINES.

On and after this date traveling engineers will be know as road foreman of engines and enginemen. The following are their duties:

1. To ride on locomotives and see that they are economically and judiciously operated, and to see that the instructions as contained in circular No. 10 are carried out by both engineers and firemen.

2. To investigate all complaints made by the operating department against engines or enginemen who fail to make time and handle trains properly.

3. To have full charge of the wipers at outstanding engine houses, and to see that the premises and surroundings are kept neat and clean.

4. To keep the master mechanic advised as to the general condition of the power, particularly at points where no foreman is in charge. He will settle all disputes between engineers and firemen, and his decision will be lived up to until it has been decided by higher authorities, should an appeal be necessary.

5. To keep thoroughly posted on the performance of locomotives, and if not satisfactory, ascertain the reasons, and endeavor to assist in getting a better performance.

6. To review the work book occasionally, and when work is not reported in an intelligible manner, make note of same and take up with the individual at fault.

7. To see that such work as cylinder packing, valves blowing, leaky flues, etc., is given prompt attention, and if satisfactory reason is not given the same to be reported to the master mechanic forthwith.

8. Stimulate a lively interest in engineers and firemen in matters pertaining to their business; to instruct in such a way as to reach a higher degree of intelligence.

9. To have engineers thoroughly understand that they are responsible for the condition of the engine intrusted to their care, and engines must be kept clean by the firemen above the running board and be in a presentable condition.

R. QUAYLE,
Supt. M. P. and Mach'y.

While the rules set forth in these circulars may not fit the existing rules and practice of all railway companies, I consider the idea and general plan first-class and very commendable. I had the pleasure of meeting Mr. Quayle about a week ago and of talking with him on this subject, and was shown that the total number of engine failures on their system had been reduced within a very few months from over four hundred to but little over two hundred per month, no small percentage of which is credited to the efforts of the traveling engineer or road foreman of engines and his co-operating with the superintendent as well as master mechanic.

A traveling engineer should not be given too much territory. In my opinion two main line divisions are all one man can do justice to when the road is doing good business, and it is my belief that he will accomplish more for the company with that amount than with more territory, especially if he is put in charge of train as well as enginemen. I am aware of the fact, however, that it is the general practice in the northwest to give him much more territory. In such cases it is important that he should not be called from his work on one division to another, except in very urgent cases, before he has finished on that division.

By close observation and wholesome advice and instructions to enginemen concerning the manner of handling and firing engines, and to roundhouse foremen, he may effect a saving in fuel alone that will amount to many times his salary. The saving traveling engineers can accomplish by closely inspecting engines and getting enginemen interested in them, while perhaps not so easily computed, is nevertheless an important item, and will be noticed in a reduction of cost for repairs and a reduction of the number of engines breaking down. Checking and calling attention of engine and trainmen to little deviations from rules and good practice, which would escape men in offices, and noting evidences of indifference or incompetency of employes, which should be weeded out and which would be difficult for a master mechanic or superintendent to obtain except through the traveling engineers, also has an effect on the service which would be difficult to compute in dollars and cents. By noting carefully the performance of engines over the different parts of the road they may be enabled to recommend an increase of tonnage that will very materially increase the net revenue of the company by reducing the cost of moving freight, and there are many matters pertaining to the expeditious and economical movement of trains concerning which, on account of being constantly on the road and on all classes of trains and engines, they are enabled to make pertinent and valuable suggestions.

During the past two years the general condition of the motive power on the line with which I am connected has been very much improved, a very noticeable saving in fuel has been accomplished, and there has been a decided increase in tonnage handled per train. In bringing these conditions about our traveling engineers have given very valuable assistance.

In order to accomplish the most good the traveling engineer must have the confidence and respect of the men under his supervision, and his dealings with them should be such that fair-minded, honest, competent men will be pleased to have him ride with them and inspect their engines, or visit their roundhouses, and, while he should keep his superior promptly advised of irregularities, he should not be overzealous to report little things that could be remedied by taking the matter up quietly at the time with the man at fault.

His salary should be such that he will not wish to return to his engine in order to obtain better wages; he should be allowed reasonable living expenses when away from home, and should be given an occasional word of encouragement in recognition of good work.

In order to fulfil all these duties and requirements it will be readily seen that the traveling engineer must be thoroughly conversant with all parts of the locomotive, and an experienced and expert runner. He should be competent to conduct such road tests as may be required from time to time for the purpose of determining haulage capacity of locomotives over certain parts of the road, and make comparative tests of different kinds of fuel or appliances to locomotives, etc. He should be able to make an intelligent report of same and should be thoroughly conversant with air brakes, and competent to instruct regarding same in the absence of a regular air brake instructor. He must be patient, conscientious, loyal to his company, fearless and just in his dealings with all.

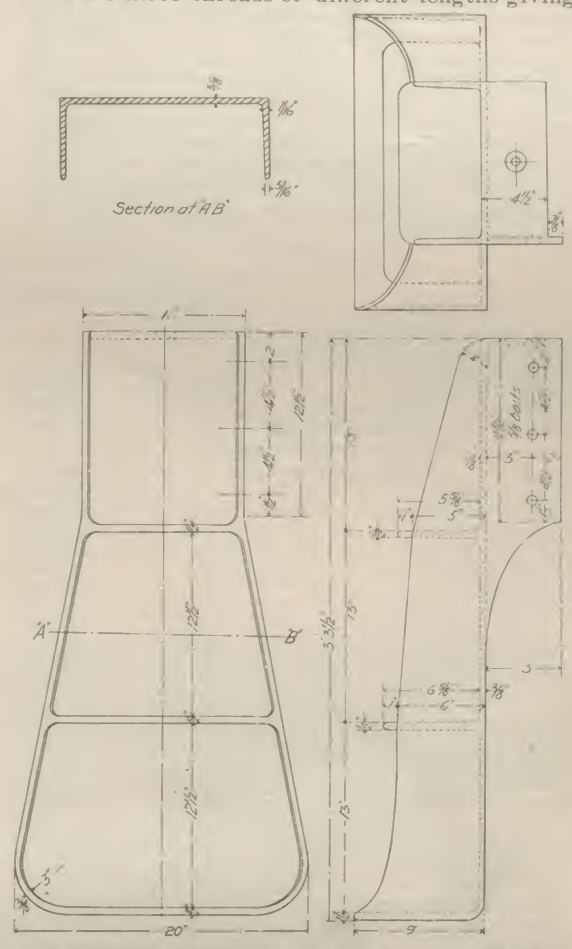
TENDER STEP—CHICAGO ROCK ISLAND & PACIFIC RAILWAY.

The matter of form and location of locomotive steps and handholds has such a bearing upon the safety of life and limb of men who are called upon to climb on and off of engines, as to place it among the items which should receive careful attention from designers. There are many safe steps and sometimes a number of different designs in use upon the locomotives of different types upon one road which introduces an element of danger from the mere lack of uniformity. The report of the committee appointed to treat the subject of "Steps and Handholds" at the Master Mechanics' convention concluded with the following paragraph.

"In conclusion your committee is of the opinion that to insure comparative safety the form and location of locomotive steps and handholds should be so nearly uniform that in mounting or alighting one could, even in the dark readily locate with his feet and hands all the steps and handholds of any locomotive."

A wide double step was recommended for the front corner of the tender and long handholds both upon the end of the tank and upon the back of the cab as well as upon the cab bracket. The step illustrated in the report has two steps with a total hight of 31 in. from the lower step to the top of the end sill and an allowance of 12 in. between the top of the rail and the lower step which should be uniform. This step is provided with foot guards for preventing the feet from passing over the tread of the step and the back of the step casting is made in the form of a web for this purpose the web being cut away at the center to lighten the casting.

A very similar step to that recommended by the committee is shown in the accompanying illustration which was prepared from a drawing received through the courtesy of Mr. George F. Wilson, superintendent of motive power of the Chicago, Rock Island & Pacific Railway. This step was designed by Mr. Wilson for use upon the new eight wheel passenger locomotive recently built by him and which was illustrated in the RAILWAY REVIEW of May 30, of the current volume. The general view of the locomotive, shown in that issue gives the location of the step upon the tender where it is attached to the end of the end timber. The step casting has a cavity at the top to receive the end of the timber and this forms a metal protection to the top step. There are three threads of different lengths giving



LOCOMOTIVE STEP—C., R. I. & P. RAILWAY

considerable flare at the bottom and the back of the whole casting is solid with no openings making it impossible to have trouble due to the slipping of the feet beyond the treads. Attention is also called to the long handholds provided by Mr. Wilson and shown in the engraving of the locomotive referred to. These are exceptionally simple and long and they would seem to be well adapted to a standard plan of steps and handholds for locomotives which differ considerably in hight as well as in the other dimensions of the gangway. This may be said to be an example of good steps and handholds which cost no more than poor ones and also includes the possibility of standardizing them.

LOCOMOTIVE TIRES WITHOUT FLANGES.

In the discussion upon the advisability of abandoning flangeless tires upon locomotives recently held before the New York Railroad Club Mr. E. E. Russell Tratman contributed the following as showing the variety of practices with reference to the location of these tires among the driving wheels:

The practice in the use of blank tires on driving wheels is very varied, as shown by the accompanying list, which may be summarized as follows:

Of five mogul engines, one has flanged tires on all the driving wheels, while four have blank tires on the second pair.

Of sixteen ten-wheel engines, eleven have blank tires on the first pair of driving wheels, and five have them on the second pair. With blank tires on the first pair, the rigid wheel base is the same as on an eight-wheel engine.

Of nine consolidation engines, five have blank tires on the second and third pair of driving wheels, two have them on the second pair only, one has them on the third pair only, and one has them on the second and fourth pair.

Of three twelve-wheel engines, two have blank tires on the second and third pair of driving wheels (one of these engines having them on the main drivers), and one has them on the second and third pair, the second pair being the main drivers and having flanged tires. The decapod engines of the Erie Railroad have blank tires on the second and third pairs of driving wheels.

The only road I know of on which blank tires have been used for eight-wheel engines is the New York, New Haven & Hartford Railroad; but I believe the practice has long been abandoned on that road, after some derailments which were attributed to these tires.

Blank tires are not much used in European practice. The St. Gothard Railway has ten-wheel engines with flanged tires on all driving wheels, and a wheel base of 11 ft. 6 in. The Highland Railway, of Scotland, has ten-wheel engines with blank tires on the second (main) pair of driving wheels, and a wheel base of 13 ft. 3 in. The Paris, Lyons & Mediterranean Railway has consolidation engines (without truck) with flanged tires on all driving wheels, and a wheel base of 18 ft. 9 in. The London & Northwestern Railway has similar engines with all tires flanged, and a wheel base of 17 ft. 3 in., the two end axles having one-half inch extra lateral play.

It would be of interest if we could know the reasons for the adoption of the various arrangements of wheels with blank and flanged tires, and what relation these arrangements bear to the alignment of track, the flange wear of the tires and the train resistance. If any road has any one type of engine fitted with two arrangements of the blank and flanged tires, it would be interesting if we could know what are comparative results in the three items mentioned above. Where blank tires are used it seems to me that the brake shoe should have a bearing on the full width of the tires, so as to dress them down and prevent hollow or false flanged tires. I would like to ask if there is any special objection to the use of blank tires on the main driving wheels?

MOGUL ENGINES.

	Driving Wheel Base. ft.	in.	Blank Tires
Erie & Wyoming Valley Ry.	14	0	
Baldwin Locomotive Works (Columbian Exposition, 1893)			2nd pair
Great Northern Ry.			2nd pair
Columbus, H. V. & Toledo Ry			2nd pair
Missouri, Kansas & Texas Ry.	12	8	2nd pair

TEN-WHEEL ENGINES.

Baldwin (Columbian Exposition)			2nd pair
Baltimore & Ohio			1st pair
B. & O. Southwestern			2nd pair
Charleston & Savan.			2nd pair
Cooke Loco. Works			1st pair
Lake S. & Mich So.			1st pair
Great Northern			2nd pair
Terre Haute & Ind.			1st pair
Cin., Ham. & Dayton			1st pair
Chicago & N. W.	14	11	1st pair
Chi. Mil. & St. Paul	13	6	2nd pair
Chesapeake & Ohio	11	10	1st pair
Erie	12	0	1st pair
Southern Pacific	12	2	1st pair
N. Y., C. & St. L.	14	0	1st pair
Mexican National (narrow gage)			1st pair
St. Gothard (Switzerland)	11	6	None
Highland (Scotland) second pair main	13	3	2nd pair

CONSOLIDATION ENGINES.

Phil., Read. & New England	14	0	2nd and 3d pair
Pittsburgh Junction	14	0	3d pair
N. Y., N. H. & H.	15	0	2nd and 4th pair
Norfolk & Western (C'lumbi'n Exposit'n)			2nd and 3d pair
Illinois Central			2nd pair
Chesapeake & Ohio			2nd pair
Great Northern			2nd and 3d pair
Missouri & Moline	14	0	2nd and 3d pair
M., St. P. & S. S. M			2nd and 3d pair
Paris, Lyons & Mediterranean (France)	18	9	None
London & Northwestern (England).	17	3	None

TWELVE-WHEEL ENGINES.

Southern Pacific (second pair main drivers)	15	6	2nd and 3d pair
Great Northern (second pair main drivers			1st and 3d pair
Duluth & Iron Range	15	6	2nd and d pair

DECAPOD ENGINE.

rie R. R.	18	10	2nd and 3d pair

THE COST OF AIR BRAKE RIGGING.

In the discussion which was held by the New York Railroad Club at its November meeting of last year upon the subject of railways entering the field of manufacturing, Mr. R. A. Parke, of the Westinghouse Air Brake Co., in order to show why railways could not compete with manufacturers in the production of parts of equipment made the following remarks: "I have been very much interested within a few days to learn that one of the car manufacturing concerns of the country had extended its facilities for making forgings considerably, with a view to furnishing to railroads the Master Car-Builders' brake gear upon designs for their own special cars, in styles and proportions of levers that they require—jaws and fittings throughout—and they are offering to sell to the railroads the Master Car-Builders' brake gear complete for a price that is about one-third of the lowest estimate that I have seen handed in by car-builders to their superior officers. I do not believe that there is a railroad in the country that can afford to manufacture the Master Car-Builder's brake-gear to put on its own cars in view of such prices as these that I have seen. * * * It seems to me that this is a very good illustration of the advantage that comes from single manufacturers, that is, for manufacturers of certain line of goods turning out large quantities over and above that which would be possible to reach in shops where mixed work is done, and the use of tools divided among different things and the time of the men the same way."

This statement called forth a letter which passed through the hands of at least two members of the North-West Railway Club, and was presented to that organization at its February meeting. This letter was in defense of the Master Car-Builders of the North-west, which section was the one to which Mr. Parke referred, from the implied charge that it cost the railroads of that section at least three times as much to have their car departments manufacture brake-rigging as it would to buy that equipment, and from the "severe imputation on the efficiency of the machinery departments of the railroads where Mr. Parke is acquainted with the master car builders." The letter also contains the following paragraph:

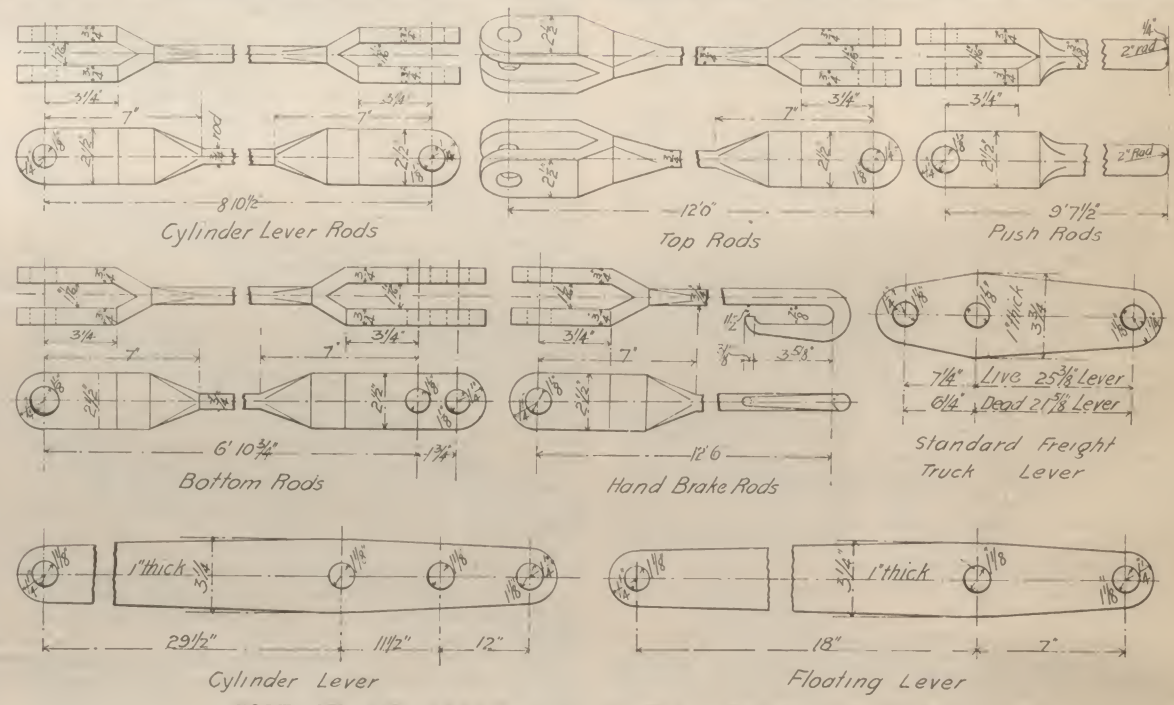
"In an estimate recently made by one of the roads running into St. Paul, the total cost of making the material required for applying air-brakes to a 36-ft. car, exclusive of the material received from the air-brake company, but including the road's standard trussed brake beam and all pipe and fittings, was estimated at $28.68. This estimate, as far as labor was concerned, was not based on large orders, but was the actual cost of work that had been turned out in small quantities previously, and the actual cost of the work which is being turned out is running considerably below that estimated. We shall be in a position in a few weeks to give the actual cost to this road of turning out the work in comparatively large quantities, but for the present we will simply confine ourselves to the estimate which we can assure you is higher than the actual cost of the work. Of the $28.68 the material cost $21.56, the labor $7.12. These are actual costs, without anything added for depreciation, storehouse expenses or superintendence. The cost of the material is based upon iron at a price of $1.35, with extras as per list bought f. o. b. St. Paul."

To this letter Mr. Parke replied promptly through the columns of a contemporary to the effect that after making his statement with regard to the ratio of one to three between contract and railway shops he had discovered that the figures seen by him were not for the rigging complete but were the cost per hundred pounds, and he then presented the following suggestions:

"The price given in the communication from the Great Northern (the communication originated on this road ED.) is $28.68, but it includes also brake beams and probably some other material than that included in what I understand to be known as the M. C. B. standard freight break gear. If the break beams, included in this estimate of the Great Northern, are of any of the well known metallic patterns, which fulfil the specifications of the M. C. B. Association, the cost of the M. C. B. brake gear would, under this estimate, certainly be reduced to a very moderate figure; but the communication does not seem to warrant a conclusion that the brake beams included in the estimates fulfil the specifications of the M. C. B. Association.

"It would be interesting to learn the cost to the Great Northern of the forgings, complete, of plate 9 of the last report of the M. C. B. Association, having the dimensions there given, with holes drilled and pins turned, as the specifications contemplate, and as, of course, the Great Northern presumably does this work. The writer is under the impression that the estimate furnished by the Great Northern officials would, if cut down by the elimination of the brake beam and other material than the forgings above referred to, still remain considerably above the price at which those forgings can be purchased in the market at least in the eastern part of the country."

This is an interesting question and without wishing to prolong the discussion at all the RAILWAY REVIEW has obtained figures from a reliable source which are applicable in this case because of coming from a northwestern road, and these practically answer Mr. Parke's question of the last paragraph above quoted. The illustrations which accompany the figures indicate the work which was done except that the small parts are not included, there being no doubt of the amount of labor upon the weight of these. These prices are low and go a great way toward showing that where details are followed up as closely in railway as in contract shops the cost of work will not be widely different in the two. The figures are tabulated as follows which apply to the fittings for a 36 ft. box car.



COST OF AIR BRAKE RIGGING—FIG. 1.—LEVERS AND RODS.

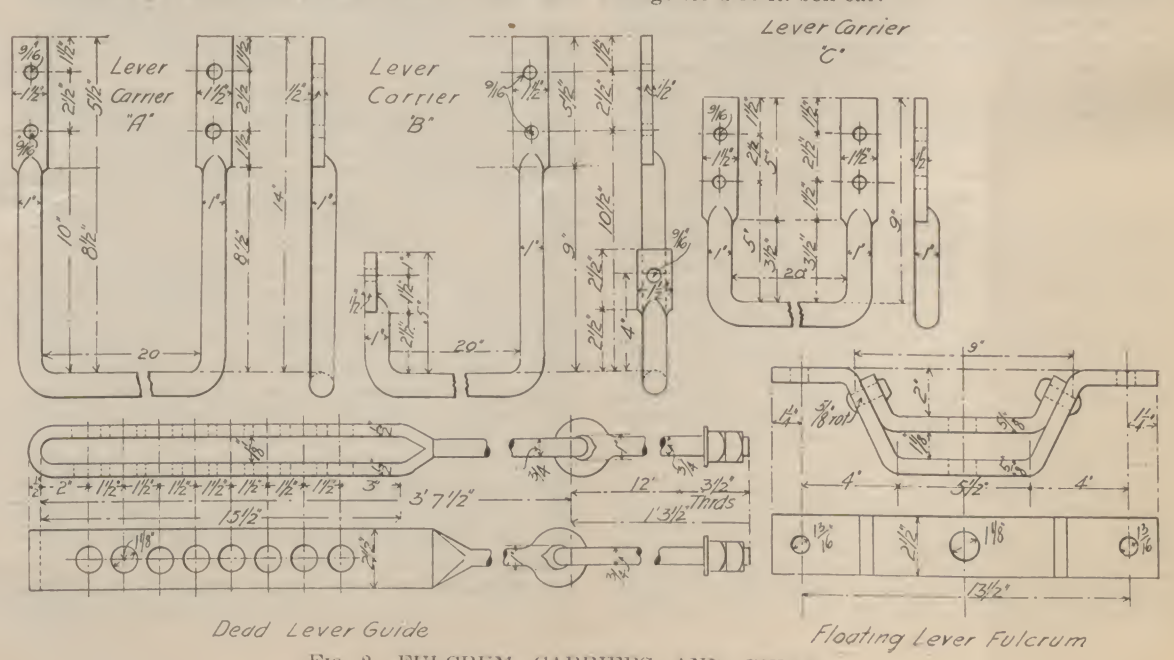


FIG. 2.—FULCRUM CARRIERS AND GUIDES.

Parts.	Cost of Material.	Cost of Labor.	Finished Weight.
2 Dead Levers	$0.81	$0.11	54
2 Live Levers	.92	.11	61
1 Floating Lever	.31	.07	20½
1 Cylinder Lever	.62	.09	44½
2 Dead Lever Guides	.50	.42	32
2 Bottom Rods	.82	.40	51
2 Top Rods	.94	.38	64
1 Cylinder Lever Rod	.39	.19	27½
1 Push Rod	.35	.15	22½
1 Hand Brake Rod	.32	.13	26
1 Floating Lever Fulcrum.	.19	.04	12½
1 Lever Carrier A	.14	.04	10
1 Lever Carrier B	.12	.04	8
1 Lever Carrier C	.12	.04	7
1 Top Rod Carrier	.05	.01	3½
1 Hand Brake Rod Carrier.	.02	.04	1
1 Pipe Clamp	.07	.05	5
1 Pipe Clamp	.04	.02	2½
3 Pipe Clamps	.13	.07	8½
2 Dummy Coupling Brackets	.04	.02	3
1 Release Valve Rod	.01	.02	1
1 Release Valve Rod	.02	.02	1½
6 Staples	.01	.01	0½
8 Brake Hangers	.92	.48	67
8 Safety Chains	.64	.16	44
8 Brake Hanger Eye-bolts.	.26	.07	19
19 Steel Rolled Pins	.62		21
Handling and Accounting		.20	
Superintendence, etc.		.84	
Totals	9.38	4.22	618

This list is comparable with the Master Car Builders' rigging and it is of further interest that on the road in question 25 per cent is added to the charges given above for labor in order to cover depreciation. With this allowance the total cost of material is $9.38, of labor is $4.22, and with a total weight of 618 lbs. the cost of manufacture is $1.52 per 100 lbs. for material and 68 cents per 100 lbs. for labor, giving a total cost of $2.22 per 100 lbs. for both labor and material. These prices are based upon the cost of turning out 150 sets of rigging. The road turning out the finished product at this cost is not especially well supplied with machinery, the only power tools being a forging machine and two forming machines fitted with air cylinders, by which such pieces as the brake hanger eyes and lever carriers are bent, but by the use of system and ingenuity, work is turned out at a price which would make it difficult for a contract shop to compete, unless it were for a large order for which it would pay to make special tools, even though the railroad company pays a higher rate of wages.

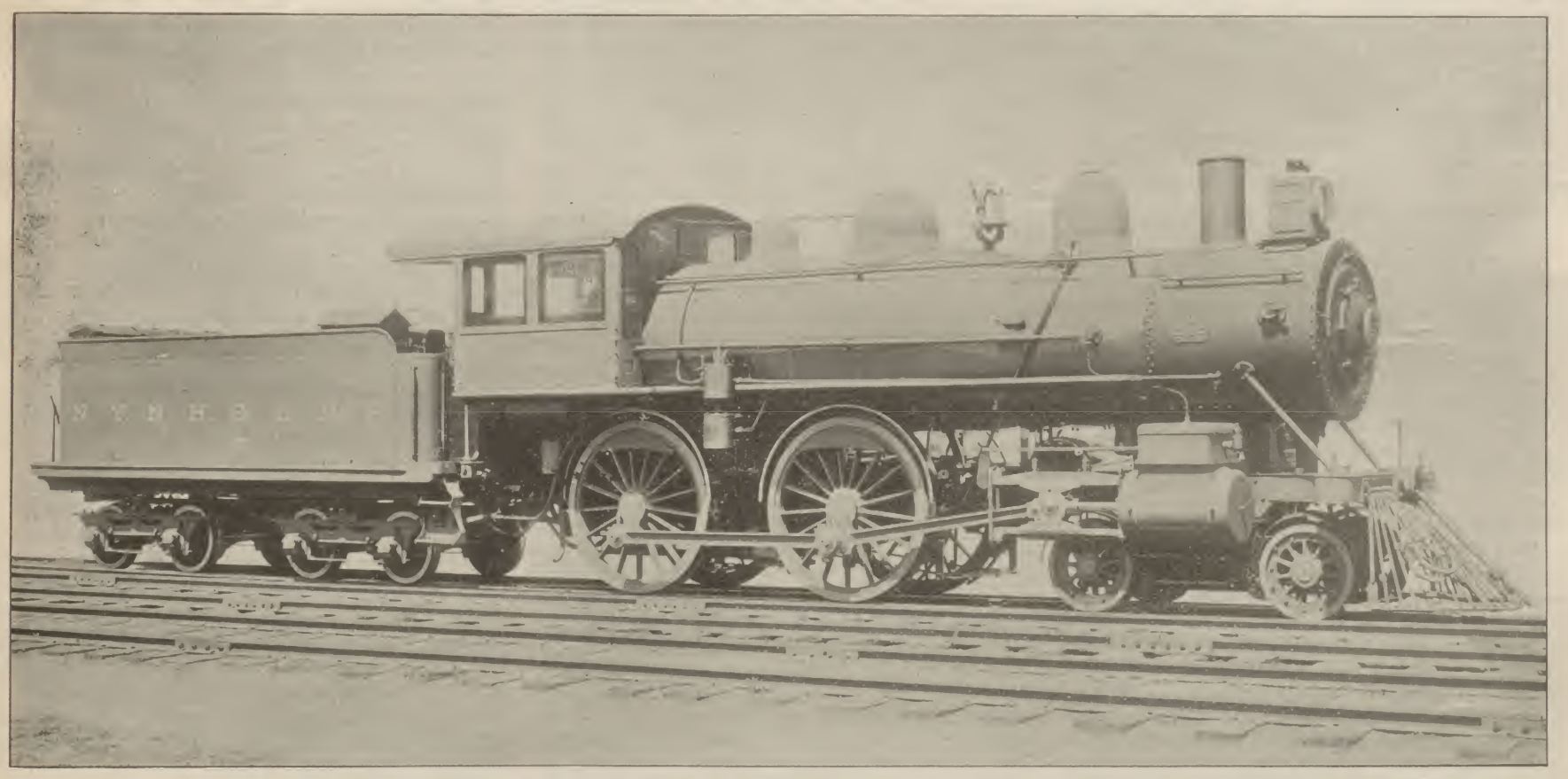
Civil Engineers' Club of Cleveland.

A meeting of the Civil Engineers' Club of Cleveland, O., was held Tuesday evening, July 14, 1896, at the rooms of the School Council, with eighty-two members and visitors present. The paper of the evening, by Mr. H. F. J Porter of Chicago, was listened to with great interest. It was beautifully illustrated by lantern slides of photos and drawings. It gave an exhaustive description of the works at South Bethlehem, Pa., and their processes in the manufacture of large forgings, and finished the exhibition of photographic plates with that of Mr. John Fritz, the founder of this great enterprise.

Mr. Porter was followed by Messrs. Oldam, Newman Dr. Langley and others in interesting remarks, and Mr. J. F. Holloway appropriately finished the topic with a glowing tribute to the worth and integrity of Mr. Fritz.

NEW FAST PASSENGER LOCOMOTIVE—N. Y., N. H. & H. R. R.

The New York, New Haven & Hartford Railroad has just received twenty new passenger locomotives from the Schenectady Locomotive Works which were designed and built from specifications prepared by Mr. John Henney, Jr., superintendent of motive power of that road. They are of the eight-wheel type and have 20x24 in. cylinders, and are for use in the exacting fast express train service between New York and Boston. This design does not embody radical departure from established practice, but instead of this it consists of a carefully considered arrangement of the details in which large cylinders and high steaming capacity are prominent. The tube heating surface is 1,946.72 sq. ft., which with a fire-box heating surface of 167.52 sq. ft., gives a total heat-absorbing surface of 2,114.24 sq. ft., which with 30.22 sq. ft. of grate area, should give ample steam-producing capacity. The extended wagon top has been used, which provides a large amount of steam space to correspond. The steam ports are 20x1⅝ in., the bridges are 1¼ in. wide and attention has been given to secure free steam passages. By comparison with the eight-wheel passenger locomotives on the Chicago & Northwestern Railway, illustrated in the RAILWAY REVIEW of November 2, 1895, it will be seen that the New Haven locomotive has more total heating surface by 210.54 sq. ft. and more grate area by 3.26 sq. ft. It is noteworthy that the driving wheels of the New Haven design are 2 in. smaller in outside diameter than the Northwestern, and with the 20 in. cylinders the New Haven engines will probably find good use for the extra heating and grate surfaces. The design which compares most closely with Mr. Henney's is that of the heavy passenger engines on the Cleveland, Cincinnati, Chicago & St. Louis Railway, which were illustrated in the RAILWAY REVIEW of August 24, 1895, and which have been very successful in performing the work required of them. For convenience of reference and comparison the following list is reproduced from the specifications:



NEW PASSENGER LOCOMOTIVE—N. Y., N. H. & H. RAILROAD—SCHENECTADY LOCOMOTIVE WORKS.

General Dimensions.

Gage	4 ft. 8½ in
Fuel	bituminous coal
Weight in working order	131,000 lbs
" on drivers	86,000 lbs
Wheel base, driving	8 ft. 6 in
" " rigid	8 ft. 6 in
" " total	23 ft. 9 in

Cylinders.

Diameter of cylinders	20 in
Stroke of piston	24 in
Horizontal thickness of piston (piston material cast steel	6 in
Diam. of piston rod (piston rod material Taylor iron)	3¼ in
Kind " packing	cast iron R. R. Co.'s style
" " rod packing	Jerome metallic
Size of steam ports	20x1⅜ in
" exhaust "	20x3 in
" bridge "	1¼ in

Valves.

Kind of slide valves	Richardson balanced
Greatest travel of slide valves	6 in
Outside lap " "	1⅛ in
nside " " "	line and line
Lead of valves in full gear	1-16 in. lead
full gear, forward and ¼ in. lap, full gear, back motio	
Kind of valve stem packing	Jerome metall

Wheels, Etc.

Diam. of driving wheels, outside of tire	73 in
Material " " centers	American Steel Casting Co. cast steel
Tire held by	shrink
Driving box material, American Steel Casting Co. cast st	
Diam. and length of driving journals (axles, Taylor iron)	9 in. diam. x 12 in
Diam. and length of main crank pin journals (pins, Krupp crucible steel)	6 in. diam. x 6 in
Diam. and length of side rod crank pin journals, (rods, Krupp crucible steel)	5 in. diam. x 4½ in
Engine truck, kind	4-wheel rigid center
Engine truck journals	6 in. diam. x 12 in
Diam. of engine truck wheels	33 in
Kind of " " "	Paige steel tired spoke

Boiler.

Style	extended wagon top
Outside diam. of first ring	62⅜ in
Working pressure	190 lbs
Mat'l of barrel and outside of fire-box,	carbon fire-box steel
Thickness of plates in barrel and outside of fire-box,	waist and throat 11-16 in.; balance ½ in
Horizontal seams	butt joint, sextuple riveted, with welt strip inside and outside
Circumferential seams	double riveted
Fire-box, length	108 3-16 in
" width	40¼ in
" depth	F 73 in. B 59⅜ in
" material	carbon fire-box steel
" plates, thickness, sides, ⅜ in., back, 5-16 in	crown, ⅜ in., tube sheet, ½ in
" water space, front, 4 in., sides, 3½ in., back, 3½ in	
" crown staying	radial stays 1 in. dia
" stay bolts, Taylor iron 1 in. dia., all drilled in	outside ends ¼ in. d. 1¼ in. deep
Tubes, material,	Syracuse charcoal iron No. 11 W. G.
" number of	312
" diameter	2 in
" length over tube sheets	12 ft. 0 in
Fire brick, supported on	studs
Heating surface, tubes	1946.72 sq ft
" " water tubes	—— sq ft
" " fire-box	167.52 sq ft
" " total	2114.24 sq ft
Grate, surface	30.22 sq ft
" style	Rocking, R. R. Co's. style
Ash pan, style	hopper, with dump plates
Exhaust pipes	single
Exhaust nozzles	4¾ in., 5 in., 5¼ in. dia
Smoke stack, inside diameter	near bottom 16 in
" " top above rail	13 ft. 10 in
Boiler supplied by two Metropolitan model E inject. No. 10	

TENDER.

Weight, empty	43,900 lbs
Wheels, number of 8, kind,	Paige steel tired plate
" diameter	33 in
Journals, dia. and length	4¼ in dia. x 8 in
Wheel base	17 ft 0 in
Tender frame	wood, R. R. Co's. style
" trucks 4 wheel,	square frames, R. R. Co's. style
Water capacity,	4,500 U. S. gallons
Coal capacity	8½ (2,000 lb.) tons
Total wheel base of engine and tender	51 ft 6½ in
Total length of engine and tender	61 ft 6¾ in

The engine is equipped with the Westinghouse-American brake on all drivers and for train, 9½ in. air pump; Westinghouse-American brake on engine truck wheels; Westinghouse engineer's air signal; two 3 in. consolidated safety valves, one muffled and one encased; magnesia sectional boiler covering; Leach sand feeding device; Consolidated car heating apparatus; one 17 in. reflector, square case headlight; spring buffer between engine and tender; tender equipped with water scoop, Miller hook, Kewanee reversible brake beam and Westinghouse tender brake.

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CHICAGO, SATURDAY, JULY 25, 1896.

THE railway managers are very anxious to improve the efficiency of their properties and are straining every energy to do so as is evidenced by the increasing number of car builder's orders which have been placed during the past few days. Iron and steel makers have within a few days made further concessions through competition for work presented for cost estimates. As yet there are no evidences of trade improvement. Traffic returns are not particularly encouraging. Fall contracts are not spoken of by mill owners. The coke, ore and billet combinations refuse to yield. Plates and shapes are fairly active, steel rails are dull when we measure demand by capacity. Large quantities of old rails are being offered at yielding prices. Bar mills are returning to work. Iron requirements for the autumn months are slowly increasing and in all probability the volume of business will be satisfactory to all reasonable expectations.

AS suggested in our issue of last week, it is understood that the post office department will not attempt to interfere with the carrying by a railroad company of its own business mail upon its own lines. As was stated at that time, it is not believed that any rightful prohibition of this service can be made and apparently the post office department has arrived at the same conclusion, for, although the order in respect to "exchange mail" is to be enforced, it will go no further. The laxity of the post office department in respect to this business is a good illustration of what might be expected were our railways operated by the government. Here was a plain infraction of the law which, without any attempt at concealment and which came under the daily observation of the post office officials, was permitted to exist for a period of fifteen years and grow to the enormous proportion of more than three million separate pieces of mail per year handled by an exchange in a single city. It was not because the legality of the act was in question but only a case where everybody's business was nobody's business and it is not difficult to conceive how in the event of government operation many such instances would occur.

ATTENTION is directed to an address of the Hon. Martin A. Knapp on the subject of pooling, the first portion of which will be found in this issue and the remainder in that of next week. This address is the one delivered before the political economy club of the University of Chicago on May 28, and to which reference was made at the time, together with the statement that it was hoped to present the address in full in a subsequent issue, which hope is now fulfilled. Of the many advocates of pooling none have made a clearer statement as to its practicability and usefulness than Mr. Knapp. He plainly establishes the proposition that if the purposes which found expression in the act to regulate commerce are to be realized, regulated pooling must be permitted. He shows that in the nature of railroad operation, discrimination is the necessary sequence of competition, and that if equal transportation facilities, to which all are entitled, are to be enjoyed, an equitable division of earnings must be effected. What makes the argument of Mr. Knapp all the more potent is that although he stands upon practically the same ground as many railroad advocates, he is above suspicion in respect to their influence—a high compliment to a public man in these days. We bespeak for the article a careful reading, believing it will have a strong influence upon congressional action in the near future.

ELSEWHERE in this issue will be found an abstract of the discussion of the paper upon "Electric Locking" which was read before the Railway Signaling Club by Mr. V. Spicer and published in full with illustrations in the RAILWAY REVIEW of May 16, 1896. The importance of this subject, which has been under estimated, is the reason for giving it this large amount of space. As the discussion shows, even signal engineers have not made themselves entirely familiar with it, which may to some extent account for the prevailing opinion in regard to it. The conditions of caring for signal apparatus have changed sufficiently in the past few years to place this branch on most of the important roads in an entirely new condition, in that on these roads there are now men possessing the necessary knowledge and experience to warrant the installation of such devices. This fact is clearly brought out in the discussion. It is safe to say that electric locking may be applied upon these roads with a reasonable probability that the apparatus will properly serve its purpose and give satisfaction. A few years ago this could not be said and there is reason to believe that a great deal may yet be learned about the purpose and scope of electric locking, especially by those who have not had practical experience with it. It may be installed in such a way as to prevent the wrongful use of signals in several ways and the trouble spoken of in the discussion with regard to two trains upon the same track taking a signal which was intended for the first one only, may be absolutely prevented by such apparatus as is described in the paper on this subject, which appeared in our issue of December 7, 1895. That so much time was occupied in treating the question of how to provide for the following train in this case, indicates that the possibilities of which this apparatus is capable are a proper subject for investigation and no time should be lost by signal engineers in getting at the inside of this subject.

PROBABLY no one thing in connection with railroad operation needs a more thorough overhauling and rehabilitation than the reports and statistics at present in vogue upon many roads in this country. It is no doubt useless to expect that a uniform system can be adopted for all roads. The requirements of the various state and interstate commissioners in this respect will do much towards simplifying the work, but many of the obsolete and useless forms which have been in use many years will be retained. In many cases the entire basis on which these reports are predicated is erroneous and productive of much harm. The ton-mile is an excellent illustration of this fact. As applied to either earnings or expenses it is absolutely valueless, but to it can be charged the continued depression in rates insisted on by the various legislative bodies throughout the country. In the way of direct and indirect expense it has been the most costly feature of railroad operation adopted in the United States, and yet year after year railroads cling to it as though it was the foundation of all railroad operation. So also with the various reports required of railroad employes. Many of them are useful only for the purpose of furnishing employment to clerks whose time might be better occupied or services dispensed with. Many officials also have a habit of requiring special reports which often consume a great deal of time in preparation and are rarely of any use. A case is recalled where the general manager of a railroad called upon the head of one of the departments for certain information. The preparation of the report required the exclusive time of three men for nearly a month, and when finally submitted to the general manager was quietly placed by him in the waste basket with the remark that he did not now need it. It is probably safe to say that by a thorough system of reorganization at least one-third of the reports now required upon any road could be done away with to advantage, and a material saving thereby effected. It is not intended to herein belittle the importance of statistics. The proper use of properly made statistics is most profitable, but the making of many of the present required statements is both useless and expensive.

ON the occasion of the recent resignation of a western railroad manager a local paper was moved to remark that so far as heard from not a single dealer connected with the most prominent industry on the line had offered any objection to the gentleman's leaving the service, and added that "it seems strange that railway officials fail to promote good feeling among their customers by carelessness or a false estimate of their own importance." Without going into the merits of the particular case in question or even admitting that the general charge made is founded on fact, it is still true that the impression conveyed by the attitude of many railroad men is largely in accord with the idea therein expressed. Railway men are busy men. Few people, and especially those who have business with them, apparently appreciate this fact, and it is not to be wondered at that sometimes under the press of numerous engagements and a loquacious visitor, impatience should be manifested; but the trouble is that too frequently this becomes habitual and the road thereby suffers. In former days when railroads were not as numerous as at present and competition less active, the amount of business was not materially affected by the demeanor of the officials; but at the present time a man's personal bearing has much to do with the success of the railroad with which he is connected. It cannot be too persistently impressed upon the minds of our railroad officials that if the properties under their charge are to obtain the fullest measure of success, the antagonism which for the past few years has grown so rapidly and become so intense, must be overcome. Railroads can be no longer independent of the opinion of their patrons or public sentiment in general. The power for control and regulation possessed by the public, should itself prove a sufficient check to all manifestations of arrogance or undue importance. A shipper may be a man of comparatively small influence, but he has both a tongue and a vote, and when multiplied by numbers can make himself felt in a way not at all beneficial to the interests of the road against which his actual or supposed grievance may lie. The public, faster than the railroads, have learned the lesson that the latter are the servants of the former, and realizing their power, are not slow to resent any real or supposed affront they may receive from those whom they consider dependent upon them for their very existence. Railroad managers will do well to appreciate the situation in which they find themselves, and adopt methods of conciliation and courtesy rather than arrogance and independence.

FUTURE REVISION OF INTERCHANGE RULES.

THE disposition of the important report of the arbitration committee before the Master Car Builders' Association at Saratoga, recommending changes in the rules of interchange, was perhaps not unexpected, but it was none the less remarkable that a series of changes involving such complication and effecting such large interests should be carried through in two hours. The reason for the prompt disposal of the recommendations was that the work was thoroughly planned beforehand in the meetings of the "committee of twenty-one" before which every change which had been suggested was thoroughly worked out, the final result being that no changes of importance were made that were not suggested by the committee. This clean cut way of revising the rules was somewhat of an innovation and the manner in which it was accomplished has attracted attention to the advisability of employing a similar method in all further revisions of the rules. The changing conditions in regard to car equipment will necessitate frequent alterations in the rules, and it is believed that it was Mr. J. N. Barr who first recommended the continuation of the general plan which was followed out at the last convention, his idea being to have a member selected from each of the railway clubs to constitute the committee to revise suggestions in the rules and also to originate them themselves and present these to the arbitration committee, whose report thereon should

be in type in the neighborhood of two months before the annual convention. Further than this it is thought desirable that all matters which are to come up in connection with interchange rules, particularly in the form of additions or modifications, should be submitted in writing to the secretary of the association before being brought up for discussion. This is a specially good idea which would prevent members from presenting recommendations for changes before they are thoroughly thought over and studied with regard to their effect upon other provisions of the rules. With such an elaborate code as the interchange rules have become, it would be impossible for the members to carry the details in mind to such an extent as to enable them to see the effect of changes upon other parts of the code, and besides doing away with a good deal of unnecessary discussion before the convention, this method would prevent the presentation of recommendations which were not mature and the necessity for which was not fully established. It is also believed that any one in placing a recommendation in writing or seeing it in print, would be better able to judge of the necessity of its existence and of its probable effects than if the same question was raised suddenly in the convention hall. This plan certainly seems to be a very desirable one and it is hoped that Mr. Barr's suggestion will be made in such a form as to lead to its being put into effect at as early a date as possible. The following letter from Mr. Barr was called out by a request that he should state his views upon the subject: "I did suggest the idea that the railroad clubs consider the rules of interchange in good time to allow the arbitration committee to make a report so that the secretary of the Master Car Builders' Association could print it and have it in the hands of members at least two months prior to the annual meeting: also that any amendment or modifications should be made in writing and presented to the secretary prior to the annual meeting, the recommendation for each item being on a separate sheet. I think that if anyone desires a change in the rules they can afford the time to write the matter up carefully, and if they consider it of so little importance and postpone it for verbal presentation at the association, that the proposed change is of not much consequence. I believe if such an arrangement could be carried out that it would materially reduce the time occupied at the convention in revising the rules, and that such revision would likely be made with more thought and judgement than has been done in some cases heretofore. The valuable time saved for other work at the convention would be a great consideration."

CONTINUOUS BRAKES IN ENGLAND.

The annual statistics with regard to continuous brakes have been issued by the British Board of Trade, and a copy of the document has just been received. It contains no expression of either the official or personal opinion of any of the members of this body, but merely presents statistics covering the progress made in the introduction of continuous brakes, the distribution of equipment among passenger rolling stock, a detailed record of the failures of the apparatus and the rules under which it is operated upon each of the railroads. The first thing to catch the eye is that these returns show that practically all of the passenger rolling stock, including locomotives and cars, has been equipped with continuous brakes, either of the automatic vacuum or the Westinghouse automatic systems. On December 31, 1895, 8,567 locomotives and 44,611 cars were fitted with the automatic vacuum brake and 2,943 locomotives and 19,849 cars were equipped with the Westinghouse automatic brake, making a total of 11,510 locomotives and 64,460 cars fitted with either one or the other of these types of continuous brakes. The noteworthy point of these figures is that they represent 99.07 per cent of all the locomotives and 99.4 per cent of the cars which have complied with the requirements of the Board of Trade with reference to the application of continuous brake equipment. Of the locomotives mentioned, 9,938 are completely fitted with the brakes and 1,572 are entered as being fitted with apparatus for working the brakes, which means that these locomotives have an independent steam brake for use upon their own wheels in addition to the air brake apparatus for stopping their trains. It is of interest to note in this connection that as early as June 30, 1888, 61 per cent of the locomotives and 62 per cent of the cars were equipped with continuous brakes, and since that time the proportion of vacuum apparatus which has been applied is much greater than that of the pressure type.

The comparison of the number of failures of the Westinghouse and vacuum systems during the last six months of 1895 is as follows: with a mileage of 65,261,000 for the vacuum brake there were 241 failures as against 270 failures with the Westinghouse brake on a train mileage of 30,401,000, which appears to favor the vacuum system to a considerable extent with respect to the numbers of the failures of the apparatus. The report does not give in summarized form the cost or the distribution of the failures with regard to the parts of the apparatus giving trouble, but a glance at the individual items in the returns warrants the assumption that hose failures figure materially to increase the numbers of the Westinghouse failures. It may therefore be inferred from these returns that the comparatively high regard in which the vacuum brakes are held in England is due to the numbers of the failures of the Westinghouse apparatus, which consists in the unnecessary stopping of trains or in the stopping of them more suddenly than was intended by the engine runner. It is apparent that the pressure brake is considered the safer of the two, and this to us seems, to say the least, not the policy which would be fairly expected from English roads where in other directions cost is not considered a matter to be trifled with where safety is concerned. There seems to be no doubt, however, of the ultimate general adoption of the most approved continuous brake appliances in that country, because we are informed that three trains, two of them being East Coast lines and one a suburban train on the North Eastern Railway, have actually been equipped with the quick-action Westinghouse brake.

The value of the quick-acting brakes is apparently appreciated by Major Marindin, who in reporting on the accident at Little Bytham on the Great Northern Railway, March 7, 1896, is quoted as having expressed surprise that the train in this case, which was running at seventy miles an hour, could have run twenty-seven hundred feet after the brake was applied., with a falling grade of one in two hundred. This accident occurred to a train equipped with automatic brakes, from the derailment of cars at its rear end, and the inspector said: "In this particular case no great evil resulted from the distance run after the brake was automatically applied, for it was not until the rear carriages were wrecked, or momentarily before, that the automatic action occurred, but it may not always be so, and the value of a rapid stop in many cases cannot be overestimated, * * * the rapidity in which a brake can be brought into action throughout a long train and the consequent reduction of speed in the first second or two being of extreme importance." When such sentiments as these become more general it is likely that the proportion between the ordinary automatic and the quick-acting automatic will be reversed. The record of the St. Neots accident on the Great Northern Railway of England, November 10th of last year, which occurred to a train running at a speed between sixty and seventy miles an hour, shows that the forward portion of the train consisting of the locomotive, tender and five cars, ran a distance of of 1,557 feet after the continuous brake had been applied automatically by the destruction of the rear cars of the train, before the front portion finally came to a stop. That no accident occurred to the locomotive and these five cars was surely not due to rapid action of the brakes and from these two cases it would seem that the ability to stop trains quickly was infinitely more important than to show a small number of unnecessary stops. The value of the quick acting feature is two-fold. The interval between the action of the engine runner and the application of the shoes to the wheels is highly important, as Major Marindin says, because with a train going at the rate eighty feet per second two or three seconds difference in this interval means perhaps several hundred feet of space passed over before the brakes get down to work. The efficiency of the quick action brakes is also higher in consequence of getting a higher brake cylinder pressure by taking air directly from the train pipe and this gives this type of apparatus at least fifteen per cent more retarding power. These two factors should count heavily in determining the value of brakes in cases of emergency when the greatest need exists for the quick stopping of trains.

The minuteness of these records is worthy of remark as is also the fact that from the London, Brighton & South Coast Railway a careful statement has been returned showing the number of accidents which have been averted by the use of the Westinghouse brake. Eight cases are enumerated with particulars and the service on that road is evidently considered admirable.

Pressure Upon Pneumatic Bicycle Tires.

An interesting statement was made at the Master Car Builders' convention at Saratoga with regard to the pressure to which pneumatic bicycle tires were subjected. This was in connection with the topical discussion upon the question of the advisability of attempting to mend air brake hose which had failed by bursting or by abrasion. It was stated by Mr. G. W. Rhodes, superintendent of motive power of the Chicago, Burlington & Quincy Railroad that the methods used in repairing punctured bicycle tires had suggested the application of cheap repairs to air brake hose which instead of being thrown away might be repaired at an expense of a few cents and the saving of the difference between this amount and 70 cents the cost of a new piece of hose be thereby effected.

In comparison between tires and air hose the pressure upon the former which was stated in the terms which were very high and in this connection Mr. Rhodes has had the actual pressures investigated with interesting results. The experiments were performed by Mr. J. A. Carney engineer of tests of the road, upon a bicycle of the Victor pattern with Palmer single tube tires. The pressures were taken as the bicycle was ridden for a distance of 14 miles on the evening of July 16. The pressures were taken for both wheels with and without the rider who weighed 175 lbs. Without the rider the pressure on the front tire was 9 lbs. per square inch and on the rear tire it was 26 lbs. The increase in pressure on the tires when the rider mounted it was not perceptible in the front wheel and in the rear wheel it amounted to less than one-half pound per square inch. Mr. Carney stated that the area of the inside of each of the tires was about 360 square inches, and as calculated, the addition of his weight to the pressure already in the tire was a scant half pound per square inch figured from the proportion of the weight which came upon each wheel. These pressures would of course be greatly exceeded when the tubes were subjected to shocks but it is probable that they would seldom reach the pressures under which air brake hose works in practice.

Solution of a "Mystery".

The following may be of interest as illustrative of the unreliability of technical information furnished by the daily press. The item is from the Wilmington (N.C.) Messenger:

Between the 49 and 55 mile posts on the Carolina Central Railroad there is a piece of track for a distance of nearly six miles that presents a singular condition that so far amounts to an inexplicable mystery. All trains going and coming go to grinding and start a terrible squeaking when they get on this six miles of track. The noise comes from not only one car but every locomotive, every coach and every car of whatever kind sets up a grinding as if turning a curve. The noise is something like the screeching of an oxcart that has no grease on it, and it is made by every truck in a train. The track is perfectly straight, and as there is no curve at all, the cause of the grinding and squeaking has mystified the railroad people. Every effort has been made to ascertain the cause of the difficulty. The locomotives have been examined, the coaches and cars have been scrutinized, every cross tie and every rail has been inspected, every joint has been looked at, and every foot of the track has been re-gaged, but no explanation could be found. The section master has almost crawled over the six miles on his knees in search of the cause. The roadmaster has tried his best to ferret out the matter, and the superintendent has been over the track and inspected it—all of them making repeated effort time and time again to find out what is the matter—but they have given it up as a bad job. They have not only not been able to discover the cause of the noise but have been unable to discover any theory to explain the mystery.

It is one of the railroad mysteries of the age and has been going on for 20 years. During that time the cross ties and rails have been replaced several times with new ones but without effect. Who can explain the mystery?

Usually a thing of that kind would receive no attention but from certain local detail and the vicinage

of the authority it was thought that perhaps there was some phenomenon present and an inquiry was sent to General Manager St. John, eliciting the following reply:

Editor THE RAILWAY REVIEW:

DEAR SIR:—Your letter in regard to the article herewith was duly received. The screeching noise made by wheels on the Carolina Central Railroad between the 49th and 55th mile posts is accounted for in a very simple manner. The section master's gage was about an inch too long, leaving the track open, and when the track was spiked to gage the noise discontinued at once.

Yours truly, E. ST. JOHN,
Vice President and Gen. Manager.

ELECTRIC LOCKING.

The discussion of the paper read before the Railway Signaling Club at the May meeting by Mr. V. Spicer entitled "Electric Locking" and which was published in full in the RAILWAY REVIEW of May 16 of the current volume is presented in abstract as follows:

Mr. Sperry—I would like to ask Mr. Spicer what form of electric locking he would recommend?

Mr. Spicer—The form that seems to me the most practical, not going into details, is to use the track circuit and lock the lock levers on clearing the signals for the route. Clearing the last signal, which is the distant signal, should effect the locking for high speed routes. I would recommend locking for the high speed routes and let the locking take place on clearing the distant signal, either by the act of clearing the signal, or by the act of clearing a signal and the entrance of a train under such a signal, the locking to hold good until the movement of the train is made beyond the region of the interlocking. Referring to a single track, that means beyond the derail on the far side and upon double track, the release shall occur after the train has cleared the crossing frogs. The detail of the best way of doing the locking is open to a great deal of discussion. Track circuit is preferred because with it the locking takes place at the desired point and at the desired time and holds good against being changed until every part of the train has passed off of the track. With track instruments, this can not be provided for so easily.

Mr. Salmon—I think there is no doubt but that there ought to be something to provide at least for preventing the setting up of conflicting movements, particularly on high speed routes. I think the important question involved is as to the practicability of the scheme, particularly in complicated interlocking plants. Anybody who has had any experience in the use of track circuit with our involved interlocking plants, probably realizes that it is an exceedingly difficult thing to keep it in good shape, owing to the frequency with which the tracks are permitted in many cases to get down, causing a short circuit of the track circuit, and to the numerous changes that are taking place in these complicated plants causing breaks in the track circuit, and to the further fact that at certain plants frequently the tracks are in very bad shape. They get very dirty which also causes short circuiting. Though numerous causes would arise that are likely to occasion a great deal of trouble, I would not for an instant admit that I do not believe track circuit is good on a line where any attention is given it, but very frequently an application of electric locking is likely to get a black eye, because the roads after they have a good thing do not pay proper attention to it.

On the other hand I think that members of the club, those who are in charge of installations of that character, could, by making such applications and paying proper attention to them, make the thing popular, because railway men could say that it is operated practically, and that would give it a great advantage which it does not now have. Of course the track instrument scheme can be used on simple crossings, or simple interlocking plants, but if there is any switching it is likely to cause a great deal of trouble. I believe that in many places abroad they use the track instrument scheme, particularly in France, but their arrangement is usually such that they avoid back up movements and trains usually pass out of the section where they are doing any switching, at a junction or crossing, by making use of a cross over, going back on the opposite track. That is not the case here; they make the shortest, quickest movements usually at such points.

President Gillingham—I would like to ask Mr. Salmon if in his travels abroad he saw any application of the track circuit?

Mr. Salmon—I saw some places where there had been attempts at using track circuit, but I did not see it in successful use on any surface road. One place I saw where track bond wires had been used after a fashion, but in some cases the wires had been flattened at the end and there had been an attempt to solder them to the rail. In another place they had a machine screw put in with the wire which was also soldered. However in those cases they found rust or corrosion taking place between the screw and the rail and such high resistances were introduced that it made the working of track circuit almost an impossibility. They sought to overcome that by increasing the amount of battery. Usually the battery employed has been an open circuit one, and the action is irregular, and they have had a great deal of trouble. The whole matter can be understood I think, by bearing this in mind, that their aim seems to have been to increase the battery rather than decrease the track circuit resistance, so that in many cases they would have from ten up to twenty cells on a comparatively short section of track. The result of that, with the high voltage, was very irregular action. I saw quite a little of that sort of thing, but I did not see any in successful operation. I might say that I met many gentlemen from France, Germany, Belgium, Holland and particularly a large number of English engineers who were very much interested in track circuit and it was almost the universal opinion that there must be some difference existing on European railways, either as to roadbeds or ballasts, from that existing in this country; that while they could not doubt the evidence presented by the American railway men to the effect that they were successfully using track circuits, it was in their opinion, owing to experiments they had made, quite impossible to operate track circuits on European lines. Their ablest engineers had devoted untold thought and attention to developing it and had not been successful and they did not believe they ever would be. That seemed to be the concensus of opinion. I might say also that in a little experimental application that I made, a great many of the gentlemen were first inclined to think that we had a local battery on a short circuit through our rails, that the current was not going down through the track at all, but I believe that those who have seen the thing in practical operation have a very different idea of it now. But this also militates against any experiments that one might make in track circuits and many other things over there, that is, the general opinion that seems to prevail is that American railroad men are given to overestimating the results of their experiments; that they make claims that are not warranted by facts, and that in general the Americans constitute a nation of colossal liars.

President Gillingham—Mr. Salmon made some mention of electric track application. What was that application, how was it controlled?

Mr. Salmon—It was simply for straight ahead movements and the locking took place at what we would call a simple disc signal. This was what they called their block signal, but in England every main line signal is considered a block signal and the distinction that we make between a distant and block signal is not understood there. They have their signals interlocked at all stations and all switches were interlocked and there are very few signals that are specifically block signals as we would understand them. They make use of the interlocking signal for block signals. The French application that I spoke of employs a disc signal, mechanically operated which has placed at or near it a Bailliache track instrument, simply a little circuit closing device, and when the train passes that instrument it promptly operates and by locking it prevents the release of any other levers which would set up routes conflicting with that one, until the train has passed over a similar track instrument and re-energizes the relay which it governs. I did not see this idea applied at any crossings because they are few in foreign countries.

Mr. Spicer—We are just twenty years ahead of them; that is what was done here twenty years ago.

Mr. Salmon—It seems likely to be done there twenty years from now unless some enterprising American goes over.

Mr. Sperry—I have a question on electric locking that I would like to present. A road is using the track circuit between de-rails, controlled through the signal lever. Assume the case of two trains on this road, that has no block system, one train directly behind the other. The first train passes through and the second train is following on the same clear signal. Now the question is, can we prevent the operation of derailing the second train and is it not possible for the leverman to throw back the signal and change the route for the second train? I met this question in connection with an application of electric locking and that was one of the objections brought forward to carrying the circuit between derails and operating them through signal levers. The mechanism should be so arranged that the operator cannot take the derail away from the following train. Operating men say that they must provide for running trains close together and signal engineers have often heard them demand protection for them. I would like to have a scheme outlined which would enable us to meet these conditions and permit of running trains under all conditions.

Mr. Spicer:—This is a matter of operation. An interlocking plant is designed to take care of trains which are sent out by the dispatchers or the operating department only and does not usually serve as a dispatching point. If a following train enters under a signal that is given for a preceding train, it is not impossible to throw the signal to danger on the passage of the first train; if the signals are allowed to stand and the second train accepts them as clear signals to itself, there is nothing to prevent the second train from passing and holding the route by means of electric locking just as the first one did. We had to provide push buttons to release for these unusual or transfer movements. You remember the push button was very effective, but the use of it was very much abused and helped materially to cause the abandonment of electric locking. I think that the paper shows that we have met these conditions in very good form, but that owing to the absence of authority and strict discipline of lever men, the apparatus has been thrown into disfavor and disrepute and for that reason has in some cases been abandoned. The most complete electric locking in order to be effective should hold for the whole distance between the distant signal and the last point of danger, which is the crossing or the derail beyond the interlocking. I do not see what the objection is to the hand release, if it is used under proper restrictions and by properly disciplined lever men. In fact I know that it is very effective and very useful and fills the bill entirely. It is not a complication at all. It is just as easy to use it and to maintain it as to provide against the mechanical apparatus being out of order. When the release is used the interlocking is for the time being thrown out of service, the electric locking is also thrown out of service. In the same way we go back to first principles to release the interlocking in order to make these movements and only under such conditions.

Mr. Elliott—I would like to answer Mr. Sperry's question, simply because I think that it would be a bad thing for superintendents and others not familiar with electric locking to imagine there is a great objection to it. The fact is, with the case of a train following so close after another that the second engineer is going to take the signal for the train in the advance, we have a condition that cannot be guarded against, the electric locking is not designed for any such thing. Certainly no superintendent would allow or countenance any such thing as two trains following each other in the space of 1200 ft.

Mr. Spicer—One of the schemes that has been used and is the scheme that I referred to when you asked me in the beginning what I considered the best mode of electric locking, was that the locking would take place for high speed movements and becomes operative only on clearing the distant signal. That is, the time when the locking takes effect is on clearing the distant signal. It would not take effect under a distant signal at caution until the train has gone by the home signal and entered on the section included between the two home signals on a single line, so that the locking does not take effect under such conditions if a train comes under the distant signal at caution until the train entering has passed to the home signal. But it holds until the entire train has passed beyond the interlocking region, or beyond the derail on the far side for the single line, or beyond the crossing frog on a double line, providing there are no switches beyond the crossing. We are imagining a condition of simply a crossing of two roads. These are the conditions for electrical locking that I consider fill the bill. You understand the locking does not take place under the caution signal until the train has passed the home signal and has gotten on that piece of track between the two home signals. Under high speed the distant signal is clear. A high speed train would not pass a distant signal at caution high speed. I think that this meets Mr. Sperry's difficulty.

Mr. Elliott—I do not think that the arrangement Mr. Spicer brings forward would be quite applicable in all cases. We have a junction where a distant signal is not cleared for the branch road, still it is used at comparatively high speed. It is very necessary that we have electric locking apply under all conditions.

Mr. Spicer—Mr. Elliott's incident is just one of those special conditions that is met with frequently and is provided for by locking. We are not limited to any special one of the different schemes that are shown in that paper. My endeavor was to show a variety of conditions that have been met from the beginning until the electric locking was discontinued and I think Mr. Elliott's condition is met right there. Locking can take place at any point from the distant signal, either by clearing the distant signal or by the presence of the train in the interlocked region and hold good until the train had gone beyond it or during the presence of the train on that track.

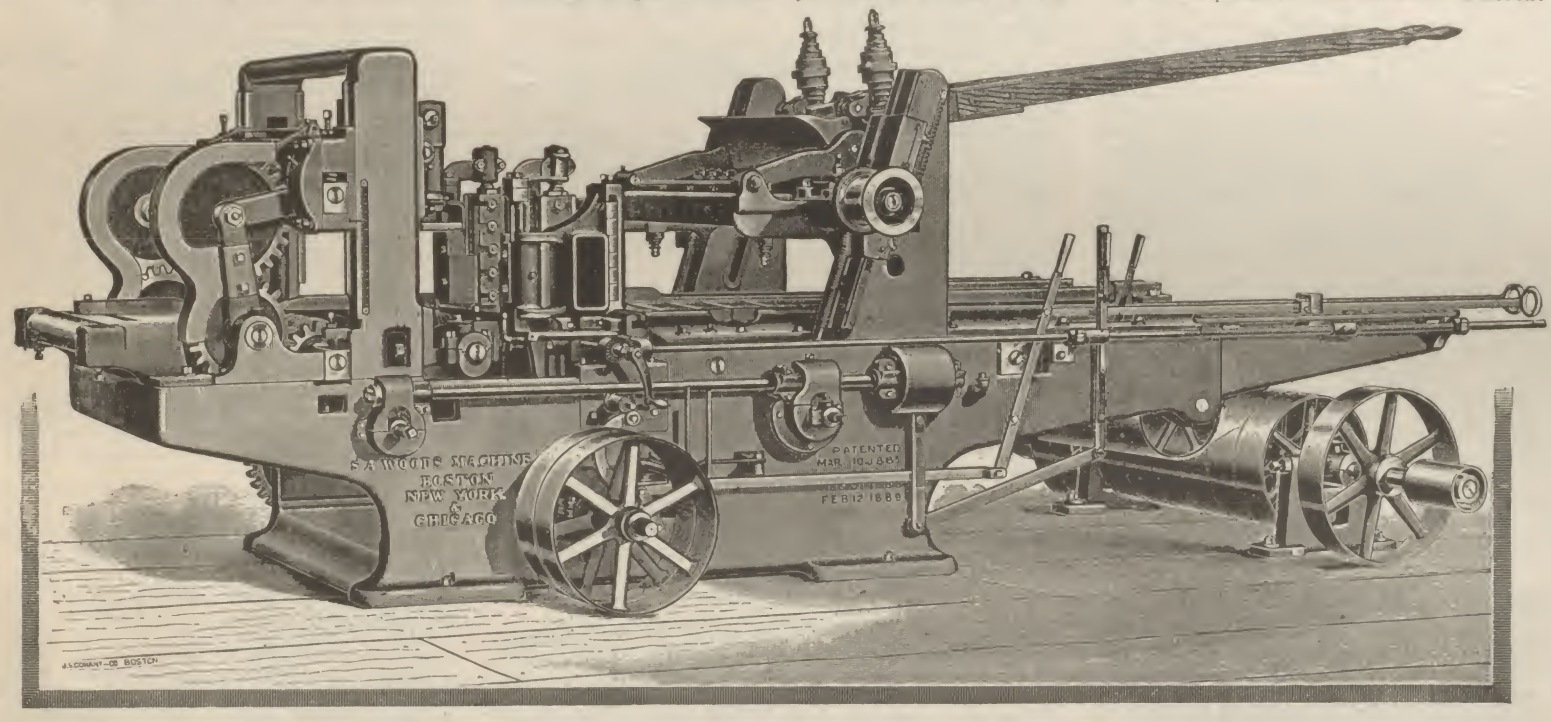
Mr. Salmon—I have brought up the question of the propriety of the use of so many distant signals, as one finds on the other side of the ocean where you have practically a distant signal for every home signal; if you have a dozen home signals, you will have as many distant signals. This is a bad scheme. Here is a question which Mr. Elliot brings up at a junction where he has but one distant signal and two diverging routes at the home signal. The trains probably pass at considerable speed. It is not perhaps practicable to hold them down to any specified speed, say 15 to 20 miles an hour, they may frequently exceed that, and if you make, in that case, a special exception owing to the particular location that you would not make at another point where you are insisting upon slow running when the distant signal is against the train, the question would come up whether it might not be desirable to have two distant signals, just as you have two home signals. I think that the scheme that Mr. Spicer outlined would be applicable in the event of having a double distant signal, that locking may be arranged to take care of that distant signal. It may seem a little revolutionary, but I think that it can be done.

NEW DOUBLE SURFACING AND SIZING MACHINE.

A new machine has been brought out by the S. A. Woods Machine Co. for surfacing and sizing all kinds of bill lumber and making it perfectly square. It is also adapted to chamfering or beading which renders it especially useful in car work. The machine is 16 ft. long, and weighs from 16,000 to 18,000 lbs. It will work to a width 30 in. and to a thickness of 14 or 18 in. The following is an enumeration of the principal features of the construction of the machine. The carrying out rolls are 10 in. in diameter and the cylinder pulleys 6 in. in diameter taking 6 in. belts. The tight and loose pulleys upon the counter shaft are 16 in. in diameter, take a 10 in. belt and are run at a speed of 1,000 revolutions per minute. These pulleys are fitted with patent self oilers. The machine is so arranged as to admit of the application of a center guide which will permit of dressing two pieces simultaneously upon three sides each. The feed mechanism consists of an endless lag bed, with a pair of carrying out rolls at the end of the machine. The lags are heavy running upon steel bearings and the rolls are strongly geared at both ends with the expansion gearing manufactured by this company.

Both cylinders are of solid steel having large

journals. They are slotted on all sides, carry three knives each, and are designed so as to be capable of taking heavy cuts. Sectional weighted chip breakers are applied before the cut of the top cylinder. The pressure rolls before the top cylinder are sectional to permit of planing two pieces of unequal thickness at the same time, and they are provided with levers at the operator's end for raising either roll independently of the other in order to enter pieces easily when considerable difference in thickness occurs. The side spindles are extra heavy and run in three bearings, the top box being removable. They carry square heads slotted on four sides and are fitted with the weighted chip breakers used by ese builders. By use of the power hoist the machine may be quickly changed while running so that timber of various sizes can be planed without sorting. The feed is very powerful and under perfect control by the operator. Special mention is made by the manufacturers of the ample belt power which is secured by the wide faced pulleys and of the large bearings with self oiling boxes which are used throughout the machine. All of the cutter heads are arranged so as to admit of easy attachment to shaving spouts or conveyors. The address of the S. A. Woods Machine Co. is Boston, Mass., from whom further information may be obtained.



DOUBLE SURFACING AND SIZING MACHINE BY THE S. A. WOODS MACHINE COMPANY.

ACETYLENE FOR CAR LIGHTING.*

As it may be of interest to know how the acetylene gas is made or manufacted on a somewhat commercial scale at present, I will briefly describe the various processes. The elements or materials used are coal or coke, limestone or burnt lime and water, and electricity as a heat agent. You see before you a piece of ordinary coal or coke and a piece of ordinary burnt lime; by crushing and pulverizing them into fine powder and mixing them in proper proportions—about 100 parts of lime and 64 to 65 parts of carbon or coke—and putting the mixture into an electric furnace, something similar in construction as shown in this sketch. and heating the mixture in a strong electric current, from 65 to 100 volts and an amperage of 1700 to 2000.

The heat produced by such a current as above indicated is sufficient to start the chemical reactions between the coal and the lime, uniting the same chemically in a compound called calcium carbide. The reactions between the coal and the lime when set in are said to be due not to electrolysis, but simply to the extreme heat produced by the electric arc; therefore, if sufficient intense heat could be produced in any other way, and on a profitable scale, the same reactions would take place and calcium carbide be formed.

I have already shown you that the carbide consists of calcium and carbon, expressed chemically as $Ca\ C_2$; this $Ca\ C_2$ has the property of being decomposed as well as that of decomposing water in contact with the same. Water as you know consists of two elements—oxygen and hydrogen. When the water comes in contact with the calcium carbide, the oxygen in the water unites with the calcium in the carbide, forming calcium oxide or slacked lime, and the hydrogen in the water unites with the carbon in the calcium carbide, forming a gas called acetylene ($C_2\ H_2$).

As to price of the carbide. At present this question is difficult to answer correctly, because in the first place the carbide is not yet to be found on commercial scale or in large quantities in the market; secondly, because the statements furnished as to the cost of producing the carbide vary so much. It is claimed by some that a ton of carbide can be produced at a cost commercially of less than $25; by others it is claimed that it will cost all the way from $50 to $100 per ton. For the following estimates I have used figures representing $50 per ton for the carbide and 10,000 cubic feet gas per ton, or which is the same as $5 per 1000 cubic feet of gas.

It is claimed that a gas burner consuming 5 cubic ft. per hour of acetylene gas will give a light equal to 250 candle power (photometric), as compared with ordinary city gas of 25 candle power of 5 cubic feet of gas per hour. When the experimental stages of utilizing acetylene gas as a n illuminant for railway coaches have passed, there will be four different ways or methods, namel y:

1. To generate the gas from the carbide direct on the train on somewhat similar principles as shown here this evening.

2. To generate the gas at certain points on the line, and compress the gas in similar cylinders now used in connection with the Pintsch gas system (capacity 170 cubic feet, 150 lbs. pressure).

3. To generate the gas in suitable gas generators, and compress it into liquid form, in steel cylinders, and put these cylinders containing the liquified gas under the cars, and with a proper reducing valve use the liquified gas direct; that is by proper means letting the liquified gas expand into gaseous form at ordinary atmospheric pressure, and burn it as ordinarily done in the Pintsch system.

4. To liquify the gas as in No. 3, and charge the cylinders in the well known manner as used in the Pintsch gas system.

The last method will probably be found to be most practical and economical, especially by railroads now equipped with the Pintsch gas outfit. Acetylene gas, can as above indicated, by proper pressures and temperatures, be compressed into a colorless liquid. The following table shows the amount of pressure required at different temperatures:

At 40 deg. Fah.	below	zero,	113	lbs.	per square inch.
10	"	"	194	"	"
32	"	above zero,	382	"	"
42	"	"	445	"	"
52	"	"	511	"	"
60	"	"	557	"	"
70	"	"	632	"	"

It is claimed that liquified acetylene, at temperatures near its critical one, might explode, in case the containing vessel is given a sudden blow or jar; that acetylene gas has a strong affinity for copper and brass, forming explosive compounds, and that this property might be objectionable in using ordinary gas fixtures; that acetylene gas is poisonous; when acetylene gas is mixed in certain proportions with air, explosive mixtures are formed and although it is true the above enumerated objectionable qualities are found in acetylene gas, it should be borne in mind that ordinary illuminating gas, especially the so-called water gas, is quite poisonous, and the same may be said as regards the mixing of air and ordinary gas. Therefore, if ordinary precautions are taken, these objectionable features ought not to be laid up against acetylene gas to any higher degree than warranted, when compared with other gas as used at present as illuminants.

In making comparative estimates between different illuminants widely different in nature, it must be borne in mind that the theoretical or photometric candle power that the illuminant is capable of producing under like circumstances can only partly enter into the comparative costs; or, in other words, if you take an electric incandescent lamp that under photometric tests shows 50 candle power, and a gas burner using ordinary gas under similar tests also showing 50 candle power, and the two lights placed in two rooms of equal size, the room with the gas will undoubtedly be better illuminated, because, although the electric light is very intense at its source, it has not the volume or luminosity of the gas; therefore in studying the tables which I presently will show you, we must not get confused when considering the given candle power for each candle light.

At present we have in practical service as illumina in railroad coaches the following systems:

1. Electric lights.
2. Pintsch gas (oil gas).
3. Carburetted air (Frost system).
4. Ordinary gas.
5. Oil lamps.

Electric Light.

There are five different systems or modifications of electric lighting, used in more or less extended service, namely:

1. Combined dynamo and storage battery.
2. Silvery battery (C. & O.)
3. Storage battery (Pullman Co.)
4. Direct current (C., M. & St. P.)
5. Lewis system (operated from the car axle.)

The comparative cost between different systems, as shown in these tables, are probably close to actual cost in service, and are supposed to be representative, and taken from results obtained in actual service from a number of coaches, sleepers, combination cars, baggage cars, mail cars; or, in other words, from train as a whole as made up in service. The first column of the tables is the average cost per car for a total outfit for each system. The next, average lamps per car calculated to 16 candle power per lamp; this column is especially intended for the different electric lights. The third column gives the total illumination per car. The fourth column gives the cost of illumination per car per day for 10 hours a day. In this estimate of cost is included all the various items—interest of money for plant, the depreciation of plant, cost of illuminant, labor, repairs, etc., and the other two columns are simply further calculations based upon the fourth column. In my estimate of the cost of acetylene, I have used the estimated cost for the equipment as given for the Pintsch gas, because the outfit will be practically the same, at least as far as the general arrangement of lamps and pipes are concerned; therefore the difference in cost between the Pintsch gas system and the acetylene gas would be due to the different cost of the gas itself and the illuminating powers of the respective gases.

SYSTEM	Average cost per car	Average lamps per car 16C P	Total illumination per car.	Cost per car day 10 hrs.	Cost per car, hour, in cts	Cost per lamp, hr in cts
Comb. dynomo and storage battery..	$968.00	22.50	360 c.p.	1 99	19 90	0.88
Silvey battery (C. & O.).....	709.00	9.30	148.8	0.944	9 44	0 82
Storage battery (Pullman Co.)..	650 00	27 00	432.00	1 694	16 94	0 70
Direct current (C. M & St. P.).....	338.00	18.00	288.00	0.800	8.00	0 44
Lewis—operated from car axle.	500.00	12.00	192.00	0.479	4 79	0.40
Pintsch gas.....	400.00	6 lamps 24.8 burners	148.8	0.943	9.43	1.57
Oil.....	72.07	6 lamps 12.3 burners	148.8	0.636	6.36	1.06
Carburetted air.....	450.00	4 lamps	400.00	0.40	4.00	1.00
Acetylene gas.....	400.00	6 lamps 12 burners	600.00	0.468	4.68	0.78

Pintsch Gas.—The number of burners to produce 148.8 candle power per car is 24.8 burners at 6 candle power each; each burner supposed to use ⅝ cubic feet per hour.

Acetylene Gas.—The number of burners in each car is estimated on 12 (6 lamps, 2 burners in each lamp); each burner supposed to consume ½ cubic foot of gas per hour.

The above tables give some very interesting figures and show that there is a great deal of room or chances yet, for any road intending to change its present system of illumination in the coaches, to look into the matter carefully—not only in the first cost of equipment but also in the cost of maintenance and effective illumination. If the estimates given for acetylene gas, both as to cost and total illumination, will come within reasonable limits as shown in the above tables, and no serious objectionable features in the practical handling of the gas are encountered, acetylene gas will, in all probability, be of quite a value in coach and car illumination—at least in comparison with oil and Pintsch gas.

In the following tables I have made some comparative

*Abstract of a paper by Mr. P. H. Conradson before the North-West Railway Club.

estimates between Pintsch gas and acetylene gas, based upon a price of $5 per 1,000 cubic feet for each gas. These figures are simply for a gas, with no other items included. The number of lamps used in each case is six. The Pintsch gas lamps have four burners each; the acetylene gas lamps have two burners each.

Pintsch Gas (gas only).

Price, $5 per 1,000 cubic feet—6 lamps, 4 burners each; each burner consumes ⅝ (0.625) cubic feet gas per hour—10 hours per day.

1 lamp	per	hour	consumes	2½	cu. ft. of gas, cost,	1¼ cts
1 car	"	"	15	"	"	7½ cts.
1 "	day	"	150	"	"	75 "
1 "	year	"	54750	"	"	$273.75

Acetylene Gas.

Price $5 per 1,000 cubic feet—6 lamps, 2 burners each; each burner consumes 0.50 cubic feet gas per hour—10 hours per day.

1 lamp	per	hour	consumes	1	cu. ft. gas - - cost	½ ct
1 car	"	"	6	"	- - "	3 ct
1 "	day	"	60	"	- - - "	$3.00
1 "	year	"	21900	"	- - "	109.50

It is said that Pintsch oil gas is and can be manufactured at a cost from $2.50 to $3 per cubic 1000 feet in the holder. I believe this can be easily done; but the invoice prices of the gas as delivered compressed in the cylinders under the car, besides results from actual number of hours burned, show the price to the railroad companies to be about $5 per 1,000 cubic feet. Parties interested in the manufacture of calcium carbide and acetylene gas claim that they can manufacture the calcium carbide for less than $25 per ton, and that one ton of the carbide makes 10,000 cubic feet of pure acetylene gas; this gas ought then to be had in quantity, ready for service on cars, at $5 per 1,000 cubic feet. Therefore, the initial price per cubic foot of the two gases being the same, the difference in practical value, if any, would then be in the greater illuminating power, and, in consequence less consumption of gas, for the one giving the most light in the car for the least amount of gas used. From the above table it would appear that acetylene gas will cost less than one-half as compared with Pintsch oil gas for railway service; besides this it should be considered that the acetylene gas would give more light.

In practical service it should not be forgotten, in comparing the two gases that all things being equal, namely, that the initial price of the gas is the same per cubic foot, the efficient illumination in the car for all practical purpose also considered the same, the acetylene gas will show its value in this respect: that assuming that a system is adopted by having the gas compressed in gas cylinders, as is now used in connection with Pintsch gas, of the capacity of say 200 cubic feet, compressed to 200 lbs. per square inch in the cylinder, the acetylene gas will last over twice as long as the Pintsch gas for similar service; consquently it would not be necessary to charge the acetylene cylinders more than one-half as often.

It should be further considered that if Pintsch gas should be used on trans-continental roads, and roads having a number of branch lines not to be connected at one or two head stations, it would be necessary to have several complete plants. On the other hand, if acetylene can practically be adapted, it can be furnished in liquified form, and the cylinders simply will then have to be kept at certain points, and whenever gas cylinders under the cars have to be recharged, there need be no pumping apparatus or other outfit.

TECHNICAL MEETINGS.

The American Society of Civil Engineers holds meetings on the first and third Wednesdays in each month, at 8 p.m., at the House of the Society, 127 East Twenty-third street New York City.

The Association of Civil Engineers of Cornell University meets weekly every Friday, from October to May inclusive, at 2:30 p. m., at Lincoln Hall, New York.

The Boston Society of Civil Engineers, meets monthly on the third Wednesday in each month, at 7:30 p. m., at Wesleyan Hall, 36 Bromfield street, Boston, Mass.

The Canadian Society of Civil Engineers meets every other Thursday at 8 p. m., at 112 Mansfield street, Montreal, P. Q.

The Foundrymen's Association meets monthly on the first Wednesday of each month, at the Manufacturers' Club, Philadelphia, Pa.

The Montana Society of Civil Engineers meets monthly on the third Saturday in each mouth, at 7:30 p. m., at Helena, Mont.

The New England Railroad Club meets on the second Tuesday of each month, at Wesleyan Hall, Bromfield street, Boston, Mass.

The New York Railroad Club has a monthly meeting on the third Thursday in each month, at 8 p. m., at 12 West hirty-first street, New York City.

The Northwestern Track and Bridge Association meets on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m., at the St. Paul Union Station, St. Paul, Minn.

North-West Railway Club meets alternately at the West Hotel, Minneapolis, and the Ryan House, St. Paul, on the second Tuesday of each month.

The Engineering Association of the South meets on the second Thursday of each month at 8 p. m., at the Cumberland Publishing House, Nashville, Tenn.

Annual meeting Traveling Engineers' Association, Minneapolis, Minn., Sep. 8, 1896. W. O. Thompson, secretary 415 Marion street, Elkhart, Ind.

Annual Convention Roadmasters' Association and Road and Track Supply Association, Cataract Hotel, Niagara Falls, N. Y. second Tuesday in September, 1896.

The Railway Signaling Club holds its meetings in Chicago, Ill., on the second Tuesday of January, March, May, September and November. G. M. Basford, secretary, 818 The Rookery.

The Southwestern Society of Mining Engineers will hold a session at Albuquerque, N. M., September 16-19. Walter C. Hadley, secretary, Albuquerque, N. M.

The International Irrigation Congress will hold its fourth session at Albuquerque, N. M., September 16-19. Fred L. Alles, secretary, Los Angeles, Cal.; local secretary, W. C. Hadley, E M., Albuquerque, N. M.

The Southern & Southwestern Railway Club holds its meetings on the third Thursday of January, April, August and November, at the Kimball House, Atlanta, Ga.

The Western Foundrymen's Association holds its meetings on the third Wednesday in each month, at the Great Northern Hotel, Chicago, Ill.; secretary, S. T. Johnstone, 1522 Monadnock building.

The Technical Society of the Pacific Coast has a monthly meeting on the first Friday in each month at 8 p. m., at the Academy of Sciences building, 819 Market street, San Francisco, Cal.

The Engineers' Club of Cincinnati has a monthly meeting on the third Thursday in each month, at 7:30 p. m. at the Literary Club, 24 West Fourth street, Cincinnati, O. Address P. O. Box 333.

The Engineers' Club of Minneapolis holds its meetings on the first Thursday in each month, at Public Library building, Minneapolis, Minn.

The Engineers' Club of Philadelphia meets on the first and third Saturdays in each month, at 8 p. m., at the house of the club, 1122 Girard street, Philadelphia, Pa.

The Civil Engineers' Club of Cleveland, meets on the second and fourth Tuesdays in each month, at 8 p. m., at the Case Library building, Cleveland, Ohio.

The Association of Engineers of Virginia, holds its informal meetings on the third Wednesday of each month from September to May inclusive, at 8 p. m., at 710 Terry building, Roanoke, Va.

The American Society of Irrigation Engineers. Third annual meeting will be held at Albuquerque, N. M., September 16-19. John L. Titcomb, secretary, 36 Jacobson block, Denver, Col.

The Western Railway Club of Chicago, holds its meeting on the third Tuesday of each month.

The Central Railway Club meets on the fourth Wednesday of January, March, April, September and October, at 10 a. m., at the Hotel Iroquois, Buffalo, N. Y.

The Denver Society of Civil Engineers meets on the second and fourth Tuesdays in each month except July, August and December, when they are held on the second Tuesday only, at 36 Jacobson building, Denver, Colo.

The Western Society of Engineers holds its regular meetings for the transaction of business and the reading nd discussion of papers on the first Wednesday of each month except January.

PERSONAL.

Mr. W. F. Jones is now auditor of the Florence & Cripple Creek road vice Mr. W. Kopfer.

Mr. W. C. Modisett has been appointed assistant superintendent of the St. Louis & Hannibal in addition to his duties as general freight and passenger agent.

Mr. Frederick C. Salter, traveling freight agent, has been appointed general agent of the Northern Pacific in New York in place of Mr. George R. Fitch resigned.

Mr Edward Woodbury of Kalamazoo has been elected president of Chicago, Kalamazoo & Saginaw Railway, to fill the vacancy caused by the death of President A. J. Bowne.

Mr. C. R. Nehr, formerly engineer of the Rochester division of the Western New York & Pennsylvania, has been appointed resident engineer of the Erie Canal, at Rochester.

Mr. Nicholas Monsarrat, late president of the Columbus & Hocking road, has been elected vice president of the Columbus, Hocking Valley & Toledo Railway, with office at Columbus, Ohio.

Mr. H. C. Smith, secretary of the Central Freight Assocation, has resigned, to take effect Aug. 1. Mr. Smith will go to New York to take charge of the rates for the Joint Traffic Association.

Mr. Ivey G. Preston, heretofore connected with the Illinois Central at New Orleans, La., has been appointed superintendent of the New Orleans & Western, with headquarters at New Orleans.

Mr. C. Sullivan, acting superintendent of the Oregon Central & Eastern, has been appointed superintendent of that road in addition to his duties as roadmaster and superintendent of bridges and buildings.

Mr. D. B. Maurer, who has been on the streets for the Lake Shore for a number of years at Toledo, Ohio, will succeed Mr. F. D. Wheeler as soliciting agent for the West Shore fast freight line in the same city.

Mr. S. L. McDonough, for thirteen years with the Santa Fe passenger department on the Pacific coast, has been appointed traveling passenger agent of the Great Northern line, with headquarters in Philadelphia.

Mr. S. B. Wight has been appointed assistant purchasing agent of the Michigan Central Railroad. Mr. J. R. Dutton, who has been for several years purchasing agent, continues in that position, with Mr. Wight as his assistant.

Mr. Malcolm Jackson formerly of Richmond, Va., has been elected president of the Parkersburg & Charleston Railway, a new line which connects the Ohio and Kanawha rivers, passing through the coal regions of West Virginia.

Mr. P. T. Downs, superintendent of transportation of the Gulf Colorado & Santa Fe, owing to the promotion of L. J. Polk to the position of acting general manager, has received the appointment of acting general superintendent. The understanding is that the appointment in both cases will soon be made permanent.

Mr. J. D. Rayne has been appointed assistant general passenger agent of the Florida East Coast Line, and for the time being will have charge of the passenger department, pending the appointment of a successor to Mr. Joseph Richardson, who resigned to except the commissionership of the Southern Passenger Association.

Mr. W. F. Kantz, who has been chief clerk in the office of the general freight agent of St. Louis Southwestern lines in Texas, has been appointed general eastern freight and passenger agent, with office at Pittsburgh, succeeding Mr. Quigg, promoted. Mr. Krantz's successor at Tyler, Tex., will probably be Mr. R. R. Redfield.

Mr. F. D. Wheeler, soliciting agent of the West Shore fast freight line at Toledo, has been appointed contracting agent for the same company at Grand Rapids. Mr. Wheeler has been connected with West Shore a number of years and has many friends among the shippers of Toledo. He will still be under the jurisdiction of Mr. A. C. Lemmers.

As it has been found necessary for the Wheeling & Lake Erie to have an outside man at Toledo, Mr. F. D. Cramer has been appointed commercial agent at that place. With the exception of a few months, when he was in the same department of the Ohio Central, Mr. Cramer has been connected with the Wheeling's general freight office during his entire railroad career.

Mr. J. M. Gruber, having been promoted to position of general superintendent of the Montana Central, with headquarters at Great Falls, Mr. J. B. Rice succeeds him as division superintendent of the Eastern Railway of Minnesota, with headquarters at West Superior. Mr. C. H. Jenks who has been superintendent with headquarters at Grand Forks returns to the Northern division.

It is reported says that Mr. A. B. Atwater, superintendent of the Chicago & Grand Trunk Railroad for the Chicago & Detroit division, will resign that position to take that of general superintendent of the Nickel Plate. Mr. Atwater is one of the oldest men in point of service connected with the Grand Trunk, having been with it for the last fifteen years, and for several years has been superintendent of the division terminating in Chicago.

Report says that Mr. C. H. Goodrich, at present superintendent and traffic manager of the Northern Alabama road, has been tendered and has accepted the position of assistant general freight agent of the Baltimore & Ohio Southwestern, vice Mr. Coope, resigned. While the line with which he is now connected is only 112 miles long, he has seen good service on the New York & New England road when Traffic Manager Randolph of the B. & O. S. W. was with that company.

At the semi-annual meeting of the board of directors of the Kansas City, Fort Scott & Memphis and Kansas City, Memphis & Birmingham held in Boston July 20, Mr. Edw. S. Washburn, now vice president, was elected president and general manager of those roads. Mr. Washburn succeeds the late Gen. George H. Nettleton, with whom he was closely associated for years. Since the death of Gen. Nettleton last March, Mr. Washburn has been in control of the business of the road. He will have the title of president and general manager, and it is understood that the office of vice president will not be filled.

Colonel L. J. Polk, general freight agent of the Gulf, Colorado & Santa Fe, will succeed Mr. B. F. Yoakum as vice president and general manager of that road. Colonel Polk will be appointed in an acting capacity, but when the directory meet in January next he will most likely succeed to the full title. Colonel Polk comes from the famous Polk family of Tennessee. He is 42 years of age, and is a graduate of the Virginia Military Institute of Lexington, Va. He entered the railway service as clerk in the general freight office at Cincinnati, of the Atlantic & Great Western, in 1874.

Mr. Chas. H. Warren after a continuous service of fifteen years with the Great Northern Railroad, the last two of which was as its general manager, has retired from active service with the company. Mr. Warren entered railway service in 1876 as clerk in the freight auditor's office of the Chicago & Northwestern, but after a few months in that position went to the Chicago, Rock Island & Pacific as clerk to assistant general superintendent. In 1881 he went to the St. Paul, Minneapolis & Manitoba and has occupied various positions with that road and its successor, the Great Northern, until the present time. The duties heretofore performed by Mr. Warren are placed in the hands of General Superintendent J. M. Barr of the eastern division of the road who is appointed to the general superintendency of the entire system.

The operation of the Grand Trunk road in Eastern, North, Middle and Western divisions has necessitated a number of changes in the official staff. According to circular, Mr. Wm. Cotter is appointed superintendent of the Eastern division, with headquarters at Montreal, Que. The officer of assistant superintendent having been abolished, Mr. J. Webster is appointed superintendent of the

Northern division, with headquarters at Allandale, Ont., and Mr. E. H. Fitzhugh is appointed superintendent of the Middle division, with headquarters at Toronto, Ont. The report last week of Mr. Fitzhugh's appointment as local manager at Toronto was incorrect. Mr. George C. Jones is appointed assistant superintendent of the 15th, 16th, 17th, 18th, 19th and 24th districts, with office at London, Ont. Mr. J. R. Williams is appointed trainmaster in charge of first district, vice Mr. C. Woodman, assigned to other duties. Headquarters at Portland, Me. Mr. J. M. Riddell is appointed freight agent at Montreal, vice Mr. A. Burns, resigned.

Several changes in the officials of the Kansas City, Fort Scott & Memphis and the Kansas City, Memphis & Birmingham will take place in August 1. Mr. J. D. Riddell, who for a long time has filled the position of assistant general freight agent of the Kansas City, Memphis & Birmingham acceptably at Birmingham, has been transferred to Kansas City, where he will act in a like capacity for the Kansas City, Fort Scott & Memphis road. Mr. Riddell will be succeeded here by Mr. M. P. Washburn, at present chairman of the southeastern Mississippi Valley freight rate committee, who is a thorough freight man, as his present position will imply. Mr. Washburn has seen more than thirty years of active railroad service, and has been connected with many of the leading lines of the country. He began as bill clerk in the Burlington freight office at Burlington, Ia., in 1865. He climbed by stages until he became assistant general freight agent of the Burlington. In 1875 he went to the Michigan Central as general Chicago agent. He later was manager of the Hoosac Tunnel Line, and then general traffic manager of the Fitchburg, Troy & Boston. In 1879 he quit railroading, but in 1890 resumed it as freight traffic manager of the Big Four. A year later he took the same position with the Memphis route and held it until last January when he was elected vice president. Mr. Washburn is a brother of Mr. E. S. Washburn now president and genmanager of the same road.

RAILWAY NEWS.

Buffalo & St. Mary's.—The tracklaying on this road in Elk county, Pa., is completed, thus connecting the towns of St. Mary's and Clermont by a line 25 miles in length. It was built by the owners of the St. Mary's & Southwestern and Clarion River roads in Northern Pennsylvania from Shawmut through St. Mary's to Clermont, where a connection is made with the Western New York & Pennsylvania. Mr. B. E. Wellendorf of St. Mary's is superintendent.

Centralia & Chester.—The formal opening of the Centralia & Chester extension from Centralia to Salem, took place on July 16. The new line is about 14 miles long and is an extension of the present line now in operation to Centralia. The total length of the road with the new line will be 75 miles, the western terminus being at Evansville.

Chicago, Hammond & Western.—This road is now in operation from Blue Island to Whiting having absorbed the Hammond & Blue Island road. Although only about 14 miles in length it makes connection with some 15 lines entering Chicago from the east and south, and with the completion of the part now under construction from Blue Island north and east to a point on Lake Michigan, will cross all the western and northern lines, making a complete belt line around the city Mr. C. W. Hotchkiss of Chicago is chief engineer.

Chicago, Milwaukee & St. Paul.—Work on the double track of the Council Bluffs & Omaha division of the Chicago, Milwaukee & St. Paul road has been resumed, and it is expected the additional track will be completed as far as Genoa, fifty-seven miles from Chicago, by September 1. The intention is by the first of next year to double track the division through to Savanna, on the Mississippi river, 138 miles from Chicago, which at present is double tracked only to Bensonville, sixteen miles from the city, although the roadbed for two tracks was partially completed some months ago. Three construction trains, steam shovels, and a large gang of men, are at work just east of Elgin, and the force of men and appliances will be greatly increased within a short time, so the laying of rails may be completed at the time specified. The roadbed is being ballasted with gravel, and the rails will be the standard weight used on the main lines of the Milwaukee road, 75 lbs. to the foot. An additional iron bridge will be put in south of Elgin to carry the new track across the Fox river. The approaches are being graded.

Grand Rapids & Indiana.—The reorganization of the Grand Rapids & Indiana Railroad Company, recently sold under mortgage foreclosure, has been effected and as it is now practically owned by the Pennsylvania Company its future business relations will be intimately connected with that road. The new board of directors are James McCray, John E. Davidson and Joseph Wood, of Pittsburg; J. T. Brooks, Salem, O.; William R. Shelby, H. J. Hollister and T. J. O'Brien, Grand Rapids. They elected these officers: President, James McCray; vice president and treasurer, W. R. Shelby; secretary, R. R. Metheany; general manager J. H. P. Hughart general counsel, T. J. O'Brien. No immediate changes are contemplated in the heads of departments or subordinate officers.

Great Northern.—A contract has been signed between the Japanese Mail Steamship Co. Ltd., through its representative Mr. I. Wanaga of Tokio, and the Great Northern R. Co., for the establishment of a steamship line between Tokio and Seattle. The Great Northern system will thus extend its operations into the far east and its bills of lading will be in force from Tokio to Buffalo, N. Y. St. Paul will be the headquarters of the new system and one of its principal eastern terminals. The first steamer will probably leave Seattle about August 15, and for the present there will be one steamer east monthly, service to be increased as required.

Mexico, Cuernavaca & Pacific.—It is thought this road will be one of the most useful ever projected in Mexico, for it will meet a long standing want, namely, communication with the Pacific coast, giving a direct line to the best port on that side. It passes through unoccupied territory in as far as no other railroad has yet ventured there. The country is admirable, rich in natural resources, and exceptionally so in point of minerals. There is also a strong belief that good coal and in paying quantities will be found beyond the Balsas river which it is expected will be reached in a little over one year's time. The road so far has been contracted in a very thorough manner. There are 2,400 men employed in construction, divided among five company camps and four sub-contractors' camps. The bridge just beyond Ixtla has a 120 ft. span and with 100 tons of steel in its composition and the one over the Amacusac river has a 210 ft. span with 230 tons of steel in its construction. This latter bridge is built on one pier and one abutment with a wooden approach at the northern end which later on may be changed into a second span. Both bridges are finished with the exception of a little final rifting up of the members.

Milwaukee & Lake Winnebago.—On Thursday, July 23, the Wisconsin Central opened its Milwaukee & Lake Winnebago branch from Menasha to Manitowoc, giving it a short line to Lake Michigan and connections with two lines of ferries across the lake, one to Frankfort and the other to Ludington. This new branch is only 45 miles in length, but it is expected that when the line is in full operation the earnings of the Wisconsin Central will be increased at least $500,000 per year as it is now considered the most direct route from the northwest to the east. Contracts for a grain elevator have been given out and the yards are capable of storing 500 loaded cars. Pending the reorganization of the Wisconsin Central, the new line is leased for one year at $72,000. The Ann Arbor car ferry will at once run to Manitowoc, but the Flint & Pere Marquette ferry will not be ready until October. A line of boats will also ply between Manitowoc and Buffalo.

Minneapolis, St. Paul & Ashland.—The first section of the Minneapolis, St. Paul & Ashland Ry., running southwest from Ashland, Wis., for a distance of 35 miles, which was awarded to the Standard Construction Co., is now ready for the rails. This road was projected in 1895 to run from Ashland, Wis., to St. Paul and Minneapolis, and will be about 180 miles in length when completed. Rails for the entire line will be received at Ashland by water, and laid from there southwesterly. The road will open forests containing millions of feet of the most valuable hardwood and pine left in northeast Wisconsin. Mr. C. H. Pratt of Minneapolis is secretary of the company.

Mobile, Jackson & Kansas City.—As has been stated in these columns, the Mobile Jackson & Kansas City road was first surveyed in 1858 and then dropped. It was again taken up in 1869 and some 34 miles on the Mississippi end were completed and put in operation, while on the Mobile end 18 miles were partially graded, and again work ceased. Last year the matter was again taken up by English and eastern capitalists, and it is now stated that active interest is being taken in the completion of the line, and that all necessary capital needed for the purpose is forthcoming. The $125,000 required from the city of Mobile is said to be subscribed, and it is thought work will soon begin. The route is from Mobile northwest to Jackson, Miss., via Hattiesburg and the final location has been made for the entire distance. The contract for the construction work as a whole has been let to the Gulf City Construction Co., of Mobile, and there appears to be good prospects for much work to be done this year. The work will not be very difficult, the maximum grades being 52.8 ft. to the mile and the maximum curves 4 deg. There is one drawbridge to be built 290 ft. long with approaches and three fixed spans of 125 ft. each, also considerable trestling. This new line is to be essentially a southern road. The other roads in this territory are either north or northeast railroads. This railroad caters to bring the business of the northwest and west to a southern port, and not to take the business from the south to some northern or eastern port. With the present channel of 23 ft. depth Mobile bay, and terminal facilities which the company will erect at Mobile, there seems no reason why this road should not become a trunk line and be an important factor in the export trade of the south. The Mobile, Jackson & Kansas City road will penetrate a most fertile section of Mississippi, and when completed will be a valuable piece of property. There will be an entirely new timber country opened up in Mississippi, not to mention a vast amount of agricultural country which is now undeveloped. The officers are F. B. Merrill, president; T. W. Nicol, chief engineer; R. H. Stratton, secretary, of all Mobile.

Natchez Pass.—Articles of incorporation have been filed for the Natchez Pass line which is projected to run from Buckley, Pierce county, Wash., on the Northern Pacific, east following the White and Greenwater rivers, through Natchez Pass to a point on the Columbia river. The road is being built for logging purposes principally, although it will be an avenue through which the farmers can send their produce to market. It is thought the new line will be of great benefit to these ranchers, as there is a large amount of very good farming land under cultivation, but on account of the poor means of transportation, the produce has never reached market. It is understood these ranchers have put up considerable of a subsidy for the construction of the road. The incorporators own or control a large tract of fine timber land along White river which will be made accessible. The district has one of the finest bodies of timber in the state, a vast amount of which is owned by other persons and will be marketable over the Natchez Pass road. Already five miles of the track have been laid and will be ready for use in a short time. The company will extend it only as new sections of lumber are required to be opened. It will be operated in connection with the Buckley logging road, which extends a distance of two miles at almost right angles with the Natchez Pass road. The incorporators are Messrs. James McNeely William Fettig, Thomas McNeely and Charles W. Joynt. The life of the corporation is 50 years. The principal place of business of the new company is Buckley, where the incorporators reside. The capital stock is $15,000 divided into 150 shares.

Toledo, Bowling Green & Fremont.—A large gang of men is laying track from Perrysburg, on the new Toledo, Bowling Green & Fremont Electric line, at the rate of about a mile a day. About three miles of track are now down and all negotiations relative to right-of-way have been adjusted.

Washington Central.—This road is said to be a success financially under the management of Mr. C. P. Chamberlain, The last month's earnings were very satisfactory and with one of the largest crops over grown along the line to be marketed in the near future, the prospects for a good business are bright. It is hoped that the bondholders will soon begin to realize that they are the owners of a property that will soon pay dividends, although handicapped with the enormous first cost of construction of the line now in operation. The Coulee City News says: "With the extension of 30 miles to Moses Coulee the Washington Central cannot any longer afford to loiter, but should be ready to haul grain from the terminus by the first of September. The great agricultural and mineral zone that lies beyond will need help, and it can be safe to say, when the road once makes it first step forward it will not stop until the desired goal is reached and the Big Bend and Okanogan county be joined by the best operated road in the state."

NEW ROADS AND PROJECTS.

Arkansas.—Contracts have been awarded for extending the Southwestern Arkansas & Indian Territory R. from Antoine to Pike City, a distance of 15 miles. The road has been in operation between Smithton and Antoine for several years, and is now 20 miles in length. It penetrates a heavily timbered country which has supplied several large sawmills at Smithton and vicinity with material, and it is stated that near the proposed terminus is a very rich kaolin bed. It is expected to reach the terminus about September 1, and the company proposes to start the new town of Pike City as soon as the line is completed.

Indiana.—A plan to place Indiana and Michigan towns in direct connection with Milwaukee and the northwest is now in hand, in which Mr. John M. Caulfield of LaPorte is a leading spirit. The idea is to construct a road from Lawrenceburg, Ind., to Benton Harbor, the northern terminus, and thence by transports to Milwaukee. A New York exchange says: "Mr. Caulfield has interested Eastern capitalists in his project to construct transports for the carrying of loaded cars from Benton Harbor to Milwaukee and the capital is also available for the construction of the road. Benton Harbor has voted $15,000 for the construction of a bridge across the St. Joe river, near Royalton on the proposed route, which has been surveyed from Lawrenceburg to Benton Harbor. The road when completed will control a heavy traffic in freight from the northwest by way of Milwaukee, by reason of the connections it will make with leading trunk lines running east and west. During the coming week eastern railroad men will take the steps necessary to the immediate completion of the new line which will be known as the Lawrenceburg South Bend & Milwaukee R."

A new line is projected into Indianapolis under the name of Indianapolis, Logansport & Chicago R. Co., and its promotors have issued 1,600 5 per cent gold bonds of $1,000 each, payable in 30 years on a mortgage given the Continental Trust Co. of New York. Work on the line between Logansport and Indianapolis will begin soon and a strong effort be made to secure a right of way along Indianapolis' streets.

Massachusetts.—The Railroad Commission of the state of Massachusetts has given permission for the organization of the Chester & Becket R. Co., to build a line between the two towns named in the title "in order to enable the manufacturing, mining, quarrying and other enterprises located in the aforesaid towns of Chester and Becket to properly transact their business and transport their employes and material and products to and from their several works, mines and quarries, and also to enable the general public to have the conveniences and advantages of a railroad in the aforesaid towns of Chester and Becket". The length of the proposed road is 5.26 miles and the total estimated cost of construction, figured out in detail for all kinds of work and submitted to the commission was $94,411.68, including everything and 10 per cent more to cover engineers and contingencies. The town of Chester by unanimous vote decided to take stockin the road because of the expected great benefit to the town but the town of Becket will subscribe only after a certain amount of work has been done. The line runs for nearly all of the way through woods and there are three highway crossings at grade and one overhead bridge. It is not expected that there will be any demand for the transportation of passen-

gers other than the employes of the quarries. Mr. J. B. Haviland is the chief engineer.

Mexico.—Articles of incorporation of the Gulf, Rio Grande & Pacific R. & Construction Co. have been filed with the Territorial Secretary in Santa Fe, N. M. A party is now locating this line out of Juarez, and it is expected to find a pass through the Sierra Madre mountains into the state of Sinaloe, a little west of Concepcion in Chihuahua. The line has been located for about 100 miles and the ultimate terminus is to be at Mazatlan. The incorporators are H. L. Warren, of Albuquerque, and William Hutchison and B. Y. McKeys, of Deming.

Minnesota.—The branch of the Great Northern road which is to be built from Crookston to Halstad is now under contract to Foley Bros. & Guthrie. It will be 35 miles long, extending along the eastern side of the Red river, and is to be finished this summer. As the Great Northern already has a line connecting Halstad with Moorehead City, this new line will give that company two lines on the Minnesota side of Red River valley. There will be only two bridges of any importance, one crossing Sand river, consisting of a span, and the other across Marsh river, necessitating a high trestle. The contractors expect to employ 600 men and hope to be able to move this season's crops over the new line.

New Jersey.—The Hackensack & Lodi R. Co. has been incorporated to construct a railway in Bergen county, N. J. The road will be about 1½ miles in length, extending from Hackensack to Lodi and do away with the Lodi branch road now connecting with New Jersey & New York road. The incorporators are: Wm. M. Johnson, Hackensack, N. J.; David A. Pell, Saddle River, N. J.; George C. Mercer, Lodi, N. J.; Jos. L. Rusling, Paterson, N. J.; Robt. H. Monsees, Brooklyn, N. Y.; Walt. M. Brown, New York; Lewis D. Moury, Englewood, N. J. The corporation has a capital stock of $25,000, and it is said work will begin in a short time.

Texas.—A meeting has been called for July 24, at Mineral Wells, Texas, for the conference of the Gulf Brazos Valley & Pacific road committee and other committees along the line of the proposed road, to reorganize the company and inaugurate measures for the construction of the road. As has already been stated in this column, a charter for the road still exists which was obtained a number of years ago and it is said that sufficient support has already been secured to insure the success of the road. The present movement for the construction of this road from tidewater on the gulf to a connection at Red River with trunk lines of the north, is the outgrowth of the demand for transportation facilities on the part of the people on the line of this road, which beyond all question will run through the most productive sections of the southwest. In the absence of a navigable river through Texas that would serve as a regulator of freight rates, it is believed that a north and south trunk line road, to be built and owned by the people on the line, can be made to be of vast benefit to the people of the entire state of Texas.

INDUSTRIAL NOTES.

Cars and Locomotives.

—The Provision Dealers Despatch is building 14 refrigerator cars at its shops, 43d street and Ashland avenue, Chicago.

—The Carlisle Manufacturing Co., Carlisle, Pa., has closed a contract for the construction of 250 cars for the freight department of the Pennsylvania Railroad Company. This contract will enable the manufacturing company to largely increase its present number of employes.

Bridges.

The county commissioners have awarded the contract for the new bridge across the Yakima at Ellensburgh, Wash., to Geiger & Zabriskie, of Tacoma. The structure is to be a known as the combination Pratt truss. The single span across the river will be 200 ft. long and the ends will rest on tubular piers. The approach on this side will be about 180 ft. long, and the bridge will be higher than the old one, so that the grade on the south approach can be reduced to five per cent, whereas it is now about twelve. The bridge is to be of the latest approved model, and the work will be pushed on it so it will be completed before winter.

—The Wrought Iron Bridge Company, of Canton, Ohio, has contracted to build a bridge at Spruce Head, Knox county, in 96 days. The bridge is to have a sub-structure of stone and a superstructure of steel, the bridge to have six spans, each 52 feet long with a 14 foot roadway and a capacity of eight tons, with a safety factor of four. The stone substructure will be under the charge of W. S. White, of Booth Bros. and Hurricane Granite Co. and the total cost of the bridge will be $4,200,

—A meeting of the stockholders of the West Braddock Bridge Company was held a few days ago, when plans were considered for the new bridge which is to be built across the Monongahela river at Rankin. The bridge is to have a 500-foot span and 55-foot piers.

—The Kansas City, Osceola & Southern Railway has made a contract with the county court of St. Clair county for the building of a joint wagon and railroad bridge across the Osage river at Osecola. The new bridge will cost $50,000.

—The contract for building the new bridge across the Choptank river at Denton, Md., for the Queen Anne's railroad, has been awarded to a Baltimore firm. The bridge will be 2,000 feet long.

—The railroad commissioners have decided that the Liberty street viaduct over the railroad at Waterbury, Conn., shall be 480 ft. long, beginning on the west bank of the stream or ditch on the west side of the railroad the full width of the street, and that the material of the same shall be iron or steel with plank flooring.

Buildings.

—The Baltimore & Ohio Railroad Co. is reported to be about to erect a depot at Wheeling, W. Va.

—The contract for the steel superstructure of the new plant of the Slaymaker-Barry Co. at Connellsville, Pa., has been let to the Maryland Steel Co., Sparrow's Point, Maryland.

—The Wrought Iron Bridge Co., of Canton, O., has a contract for constructing the steel buildings of the Hyde Windlass Co., at Bangor Me. The foundry will be 190 x 100 ft., the machine shop 150 x 80, and the office 50 x 25 ft. It is expected that the buildings will be completed by the middle of September.

—An open-hearth steel plant will, it is reported, be erected at New Castle, Pa., costing about $750,000. Phelps, Dodge & Co., of New York; Norton Bros. of Chicago, and the tin plate and tubing mills at New Castle, Pa., are said to be among those who are backing the enterprise. The prodnct of the plant will be hollow steel billets suitable for the manufacture of all kinds of tubing, including pipe.

—The plans for the Pennsylvania Railroad Co.'s new station at Germantown Junction have been completed and approved by the officers. The work on the foundation is finished and it is understood that work on the building will be pushed forward vigorously. Bids have been asked and the contract is expected to be awarded in a few days. This station will be 103x53 ft. and two stories high. The material to be used in its construction will be Baltimore marble. The interior finish will be in classical style, with a wainscoting of Tennessee marble about six feet high. The flooring will be of marble tile. On the main floor will be two large waiting rooms, ticket offices and retiring rooms. In connection with the new station the company will erect on the north side of Glenwood avenue, west of Fifteenth street, a one-story boiler house, 49.6x66 ft., of the same material as the station. A covered passageway will lead from the new station to the trolley waiting room on Glenwood avenue, and the surrounding grounds will be laid out in drives and grass plots.

—It has been stated that owing to the increased business of the Boston & Maine Railroad it has been found necessary to have more room for the company's repair shops than is furnished by the plants at Salem and Lawrence, and that the officers have finally selected a tract of land comprising several acres just south of the business section of Concord, N. H. Here will be erected this summer a a dozen or more buildings. The architect is reticent, but from the size and nature of the buildings it is judged that this plant will not only be used as a repair shop, but also for the construction of cars and locomotives, the latter a line of work which the Boston & Maine has never attempted before. The shops at Salem and Lawrence probably will not be abandoned, as it will still be necessary to have some place of that nature near Boston. But after this year the headquarters will be at Concord, and hundreds of men will be employed there.

—The new shops of the Bausch & Harris Machine Tool Company at Brightwood, Mass., are to be located at the corner of Birnie and Wason avenues and the land abuts on the Boston and Maine Railroad. The company has shops at present in Holyoke, but several months ago negotiations were started to move the plant and the transaction has been completed. The change was made to get better facilities of all sorts and the company needed much more room than it had at Holyoke. The lot is 207x333 ft. and the building will occupy three sides of the lot with a building in the center for the boiler and engine house and the pattern rooms and blacksmith shop. The office will be in the two story part at the corner of the avenue and this building will be 50 ft. square. The main buildings are really three in number, the foundry, machine shop and assembling or erecting shop. The shops will be provided with a battery of two boilers of 80 horse power each and a Corliss cut-off engine of 125 horse power will be put in. The plant will include an electric generator of 50 or 60 horse power to generate electricity for lighting and for small motors that will be used in the shop. In both the foundry and the erecting shop there will be a ten ton electric traveling crane for handling the stock and machinery, and electricity will be used to some extent on the machines. The shops will be heated by a hot air system of the most approved design. The company makes a specialty of the manufacture of radial drills, multiple drills and drilling machines of various designs for all forms of machine work. The "Bausch" drills have a wide and enviable reputation and the increasing demand for these machines has in part made it necessary to secure more commodius quarters for manufacturing.

Iron and Steel.

—Extensive improvements are being made by the Oliver Iron & Steel Co., at its South Side plant in Pittsburgh. The old Clapp-Griffiths open hearth is to be replaced by a Bessemer plant; a blooming mill of modern type will be put in, and the galvanizing department is being enlarged to almost double its present capacity. The continuous mill, which has just been completed, has been found to work satisfactorily.

—The shipments of iron ore to Baltimore from foreign ports has considerably increased. Recently 6,200 tons were received at Sparrow's Point on two vessels. One steamship brought 3,200 tons from Concepcion bay, Newfoundland, and another 3,000 from Bilboa, Spain.

—The Schwartz Foundry Co., Ltd., has been incorporated in New Orleans with a capital of $2,000,000. Moses Schwartz, Wm. Adler, Michael G. Weil, Sidney Bradford and Alfred Jordet constitute the first board of directors.

—The Basic City Furnace Co., capital $50,000, with privilege of increasing to $250,000, has been chartered at Basic City, Va., by Wm. M. Kaufman, of Reading, Pa., and others to manufacture iron and steel, mine iron, etc.

—The Buhl Steel Co., of Sharon, Pa., capital $300,000, was chartered on the 13th inst. Directors, J. H. Buhl, K. S. Fruit, T. J. Foraker, John Carley, David Adams and Veryl Preston, Sharon; T. D. Buhl, Detroit, Mich.

—The Bethlehem Iron Co's. rail mill at Bethlehem, Pa., has been shut down for an indefinite time, on account of the lack of orders. About 1500 hands have thus been thrown out of work.

—The $1,000,000 steel plant projected by the Tennessee Coal, Iron & Railroad Co., will be reported on at an early meeting of the executive committee of the directory. The steel plant is looked upon as a balance to keep the surplus of pig iron from the Birmingham district from pressing unduly on the market.

Machinery and Tools.

—The new engine which has just been installed at the iron and steel works at North Tonawanda, N. Y., was designed by Julian Kennedy and built by the Lake Erie Engineering Works of Buffalo. The engine weighs 600 tons; the flywheel alone weighs 55 tons and makes 50 revolutions per minute; the shaft is 22 in. in diameter. This is the first engine of its type ever built in the United States.

—Messrs. Weis & Lesh, the well known manufacturers of Jackson, Tenn., recently almost doubled the capacity of their plant and, paradoxical as it may seem, did so by the reducing the number of their machines, or more properly speaking, by replacing their equipment of twelve lathes which have been running five years, with seven of the Egan Company's new and improved automatic lathes. With these lathes, owing to the many improvements embodied in them, Messrs. Weis & Lesh are, as stated, enabled to nearly double the capacity of the plant, and to better advantage than had the old lathes been retained and fewer new ones added.

—During the month of June Henry L. Leach shipped 170 sets of his pneumatic sanding apparatus, 119 of these going to the various locomotive builders for new equipment, as follows: To Baldwins, 25 for Lehigh Valley; to Pittsburgh, 22 for Vandalia and 12 for Seaboard Air Line; to Schenectady, 5 for Southern Pacific, 10 for New York, New Haven & Hartford and 2 for Fitchburg Railroad; to Cookes, 5 for Southern Pacific and 10 for Baltimore & Ohio; to Richmond, 25 for Baltimore & Ohio; to Brooks, 3 for Burlington, Cedar Rapids & Northern. Among the shipments for old equipment were thirty for the Norfolk & Western and 12 for southern Railway.

Miscellaneous.

—What is said to be the largest plate glass ever turned out in this country was that finished last week at the Charleroi plant of the Pittsburg Plate Glass Co. It measured 148x244 in.

—It is stated that if the directors of the Westinghouse Machine Co. decide to increase the capital stock of the company it will mean a further enlargement of the plant with a view to pushing the manufacture of the gas engine which this company has perfected. It is the purpose to manufacture these engines from 1 to 750 h. p.

—The Consolidated Mining & Construction Co. has been incorporated recently at Winslow, N. C., and organization was effected during the week by election of A. J. Banks, president; Percy L. Banks, secretary-treasurer, and L. M. Swink, general counsel. The company's purpose is to contract for the equipment of railroads, municipal improvements, etc. Branch offices will be established.

—C. B. Seger and others of Houston, Texas, have incorporated the Direct Navigation Co., with capital stock of $100,000, for the purpose of operating boats, etc.

—The Fairfax Construction Co., capital $25,000, has been chartered at Alexandria, Va., to construct power plants, railroads, etc.

—The Bucyrus Steam Shovel & Dredge Co., Milwaukee, Wis., has been organized under the name of the Bucyrus Co. The capital stock is $300,000. The incorporators are J. M. Millman, A. W. Robinson and A. B. Stetson.

—W. McC. Grafton, signal engineer of the Pennsylvania Lines west of Pittsburgh, accompanied by the signal committee of the Pennsylvania Lines, visited Chicago on the 20th for the purpose of examining the interlocking and signaling apparatus installed by the National Switch & Signal Co. in and about Chicago, and more particularly that work done for the Metropolitan West Side Elevated Railroad. The committee was composed of the following gentlemen: Mr. C. H. Walton, superintendent, Logansport; Mr. J. S. May, superintendent, Richmond; Mr. P. A. Bonebrake, superintendent, Louisville; M. J. C. Bland, P. A. engineer; Mr. R. Trimble, P. A. engineer; Mr. R. K. Brown, Jr., assistant engineer, Richmond; Mr. A. H. Sanford, engineer maintenance of way, were shown over the Metropolitan West Side system and expressed themselves as being highly pleased with the working of the signaling and interlocking. The very difficult problem attended upon the operation of signals across the bridge over the Chicago river, which, being of the rolling lift type, requiring three breaks in all lines of connection from the levers, was of special interest. These breaks, which have to be automatically closed as soon as the bridge is in its normal position, as well as the other complex features introduced by the operation of the third rail, which carries the electrical current, makes this work an object of interest to all signal engineers who have new problems to meet in this field of engineering.